Analysis of Effects

Upper Applegate Watershed Restoration Project

Siskiyou Mountains Ranger District
Rogue River-Siskiyou National Forest

Ashland Resource Area
Medford District, BLM

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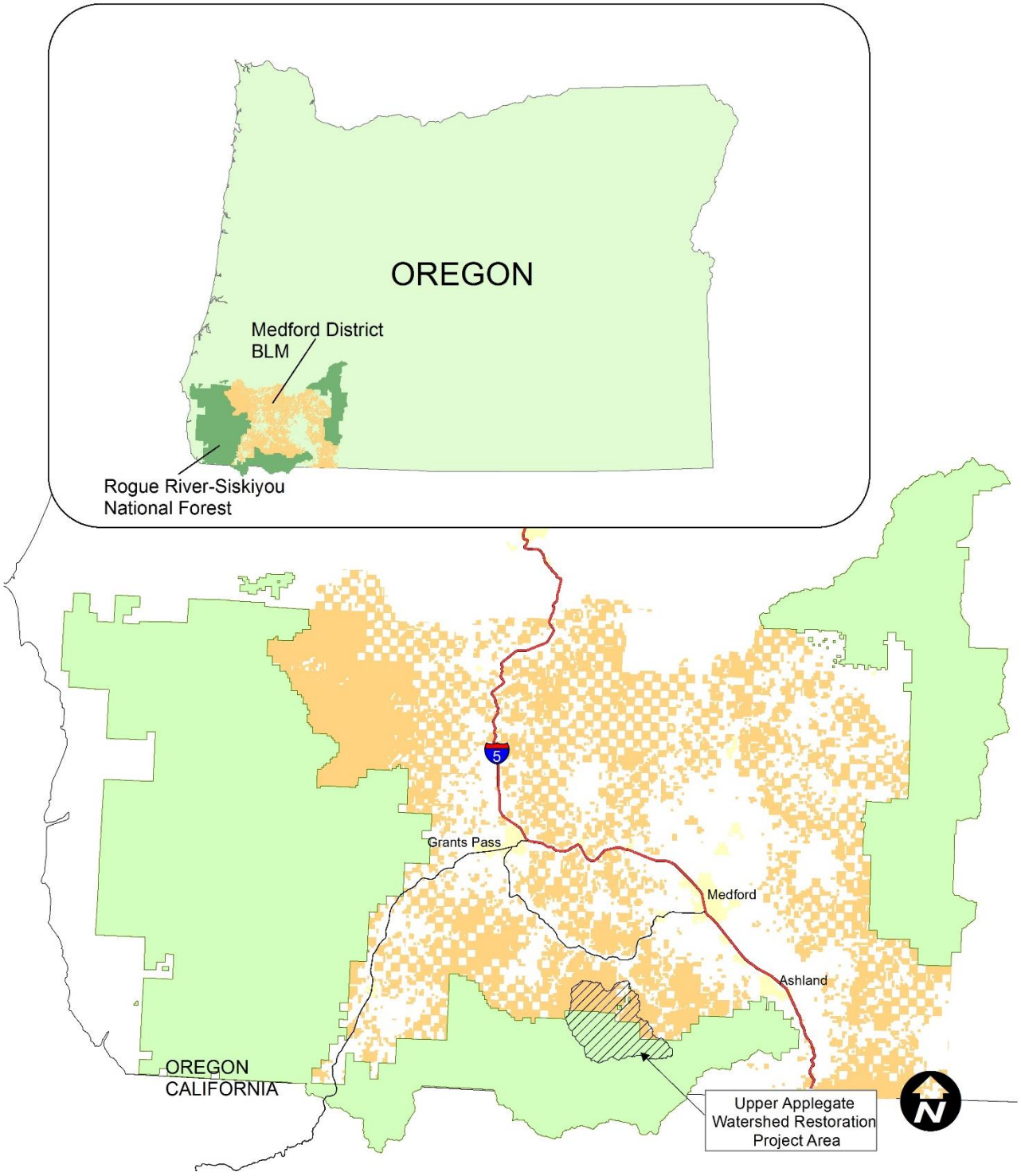

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1. INTRODUCTION

This document contains a compilation of the analysis performed by resource specialists for the Upper Applegate Watershed Restoration Project Environmental Assessment. The analysis of environmental effects is framed within the context of Federal laws, National policies, regional Standards and Guidelines, and compliance with the Rogue River National Forest LRMP, as amended by the Northwest Forest Plan.

2. ANALYSIS OF EFFECTS

A. Disturbances

Disturbances influence vegetation distribution, structure, and composition, and may indirectly and directly interact with one another and with changing climate to affect landscapes. Although there are many potential disturbance agents (wind, earthquake, floods to name several), this analysis is focused primarily on two disturbance agents important to this analysis. They include fire and insect and disease. These two disturbance agents play a large role in the Upper Applegate watershed.

A-1. Fire

Past practices of fire exclusion, forest management practices that have led to altered disturbance regimes and the increased role of altered climate regimes have left the landscape that is more vulnerable to uncharacteristic fire, insect outbreaks and disease.

Fire exclusion and suppression began in the Upper Applegate watershed over one hundred years ago. Historically frequent fire would have been widespread across the landscape. Evidence of this occurs in the Upper Applegate watershed with measured mean fire return intervals of 18 years (Agee 1993), estimates of 8-10 years (Beaver and Palmer WA 1994) and spatial data from Landfire estimating 95.5% of the landscape having a mean fire return interval of 6-15 years.

A recent historical fire regime study with plots located throughout Southern Oregon was published in 2018. One plot in the study was located in Star Gulch. Fire history from 11 trees were measured in this plot and showed the last fire occurring in this plot in 1823. The range of historic fire return was measured at 4-31 years with a mean of 12 years (Metlen et al., 2018).

Though fire return intervals were not measured throughout the Upper Applegate watershed, climatic conditions and historic burning by Native Americans would have led to high frequency, low/mixed severity fire regime. Frequent fire would have created conditions consistent with a fuel limited system, with low to mixed severity fire consuming surface fuels and reducing encroaching conifer in most stands.

Over time fire exclusion coupled with other management actions have led to uncharacteristic vegetative conditions that are less resilient to future disturbances. Dry forests of southwest Oregon have evolved and rely on fire as a natural disturbance process to drive structure and function. In fire prone ecosystems, pyrodiversity drives biotic, successional patch, and habitat diversity (Hessberg et al., 2016).

Currently as modeled by the Forest Service Wildfire Hazard Potential project, 62% of the watershed is mapped at being high risk for a wildland fire that would have the relative potential of being difficult for suppression resources to contain. This metric, though course in scale and dependent on conducive weather conditions can be informative in that areas mapped with higher WHP values represent fuels with a higher probability of experiencing torching, crowning, and other forms of extreme fire behavior that in turn would put values at risk to uncharacteristic fire conditions (Dillon et al., 2015).

Within the Upper Applegate watershed the Burnt Peak fire burned 4,147 acres in the summer of 2017. The majority of the fire area experienced low to moderate severity fire well within the historic range of variability despite having fire primarily absent from much of the area for an extended period of time (81 years). The Burnt Peak fire started on August 11 and burned into September, a period often associated with uncharacteristic or extreme fire behavior in Southwest Oregon.

However, during this time heavy smoke produced by the many surrounding fires in Southern Oregon and Northern California covered the region. This inversion created by stable atmospheric conditions reduced fire intensity by shading fuels, raising surface temperatures and not allowing relative humidity to drop below critical values as is common in August. During this time fire slowly backed from the ridges to containment lines in the valley bottoms leading to primarily low to moderate severity fire.

The Burnt Peak fire resulted in a patchwork of burn conditions well within the historic range of variability. Much of the fire area was untreated and did not experience catastrophic or extreme fire effects. However, like fire modeling under extreme weather scenarios, fire behavior exhibited during the 2017 Burnt Peak fire should not be interpreted as indicative off all future fires in the Upper Applegate watershed.

Previous treatments in the Upper Applegate Road Hazardous Fuels Project and prescribed fires conducted for wildlife and oak enhancement gave fire managers control points to work from, especially as fire approached the Wildland Urban Interface (WUI). If the ecological role of fire is to be restored to the landscape, future fuels and restoration work must be accomplished and maintained to aid in management of fire.

Large investments have been made in fuel reduction projects, prescribed fire and wildlife habitat enhancement projects in the past 20 years in the Upper Applegate watershed. In an area adapted to frequent fire, maintenance of those treatments through the continued use of prescribed fire or managed wildfire is designed to restore a natural disturbance regime, maintain treatment effectiveness and capitalize on initial investments already made (Hessburg et al., 2016, Finney et al., 2007).

Proposed vegetation management treatments are meant to further increase resiliency throughout the Upper Applegate watershed by improving vegetation conditions and structure by reducing density, increasing canopy base height, removing encroaching confers and reducing surface and ladder fuel loading through the use of thinning and prescribed fire. The principles of these treatments and corresponding changes in fire behavior are displayed in Table 1.

Table 1. Principles of fire resistance for dry forests (adapted from Agee, 2002 and Hessburg and Agee, 2003)

Principle	Effect	Advantage	Concerns
Reduce surface fuels	Reduces potential flame length	Control of fire easier; Less torching	Surface disturbance less with fire than other techniques
Increase height to live crown	Requires longer flame to begin torching	Less torching	Opens understory; may allow surface wind to increase
Decrease crown density	Makes tree-to-tree crown fire less probable	Reduces crown fire potential	Surface wind may increase and surface fuels may be drier
Keep big trees of resistant species	Less mortality for same fire intensity	Generally restores historic structure	Less economical; may keep trees at risk of insect attack

Restoration and improvement of vegetative conditions in the Upper Applegate watershed would require a combination of treatments including thinning, prescribed fire, invasive species and weed management as well as planting of native species. Future disturbance in the watershed is inevitable, however restoration of more resilient vegetation patterns can help realign future disturbance effects as well as promote natural post disturbance recovery (Hessburg et al., 2015).

A-2. INSECT AND DISEASE RELATED TREE MORTALITY

Native insects and tree diseases are integral components of forest ecosystems. Through their actions, they affect spatial and temporal stand density; structure and forest succession; forest nutrient cycling; genetic structure of forest stands; pollination of plants; and insect natural enemies. Their impacts can be as pests, benefactors or neutral components in ecosystems. Native forest insects and disease-causing organisms are agents of change resulting in disturbances that maintain diversity essential for ecosystem health. These native insects and diseases frequently interact. Established, non-native, invasive insects and plant pathogens often exert extreme impacts because they are absent the ecological constraints regulating native species that have coevolved.

The activity of forest insects and tree diseases are influenced by fire, drought, and weather patterns, among other environmental influences. Stress exerted by these environmental influences reduces host tree resistance to insect infestation and disease infection. Additional reductions in resistance due to increased host stress may accrue due to properties of the soil, particularly interacting with precipitation amount and timing, as well as other limiting habitat characteristics. Stressors and reductions in host resistance increase the amount of tree mortality due to insects and diseases.

In the upper Applegate watershed, there are four groups of native forest insects and tree diseases that are important disturbance agents, as follows: bark beetles; woodborer beetles; dwarf mistletoes; and root diseases. Of these, most tree mortality in the upper Applegate analysis area is caused by bark beetles and woodborers (Figure 1).

Bark Beetles

Several species of native bark beetles (Family Curculionidae, subfamily Scolytinae) cause mortality of conifers in southwest Oregon. The most prominent species in the analysis area include western pine beetle (*Dendroctonus brevicomis*) on ponderosa pine; mountain pine beetle (*Dendroctonus ponderosae*) on ponderosa, western white, and sugar pines; Douglas-fir beetle (*Dendroctonus pseudotsugae*) on Douglas-fir; and fir engraver (*Scolytus ventralis*) on true firs. A variety of smaller bark beetle species attack branches, tops, and younger conifers, which may contribute to and occasionally result in tree mortality. Of all these, bark beetles in pines exert the largest impact in the analysis area.

Pine bark beetles prefer or are most successful on hosts that are under some degree of physiological stress. They almost always infest host pines that are injured, diseased or of low vigor because of competition with other trees and vegetation for limited water and/or other resources. They are especially likely to kill hosts growing in densely overstocked stands. In addition, drier than normal years incur more pine mortality.

Western pine beetles frequently infest the largest ponderosa pines in a stand and/or groups of smaller ponderosa pines in dense thickets. In addition, they are attracted to fire-injured hosts. Mountain pine beetles often infest small or intermediate-sized ponderosa pines in groups. and scattered mature sugar pines of all sizes. Mountain pine beetles attack and kill mature sugar and western white pines of all sizes and are the primary source of large sugar pine mortality. Pine engraver beetles (*Ips* spp.) infest freshly cut or downed, broken material larger than 3 inches in diameter and may emerge from this to attack tops or entire standing pines, especially during drier than normal years.

The fir engraver can be a significant cause of mortality to true firs (*Abies* spp.), although infestation can occur repeatedly without causing host mortality. Fir engravers infest portions of or entire host trees that are under some sort of physiological stress or poor condition. Mortality due to fir engraver is particularly evident in areas infected by root diseases such as Heterobasidion or Armillaria during non-drought years. Fir in stands with less than 25 inches of average annual rainfall and stands during and right after significant drought events are especially prone to extensive and intense episodes of mortality caused by fir engraver.

Douglas-fir beetle activity in the analysis area is generally at low to very low levels primarily in recently downed or broken host material larger than 10 inches in diameter. Historically in southwestern Oregon, Douglas-fir beetle populations build-up in large areas of severely weakened hosts, usually due to wind or snow storms. The risk of Douglas-fir beetle infestation in standing green trees increases when there are four or more downed Douglas-fir per acre across many acres. Changing climate patterns may facilitate a change in Douglas-fir beetle activity such that its status elevates to more closely resemble its role farther east as a significant tree-killer (Agne and others 2018).

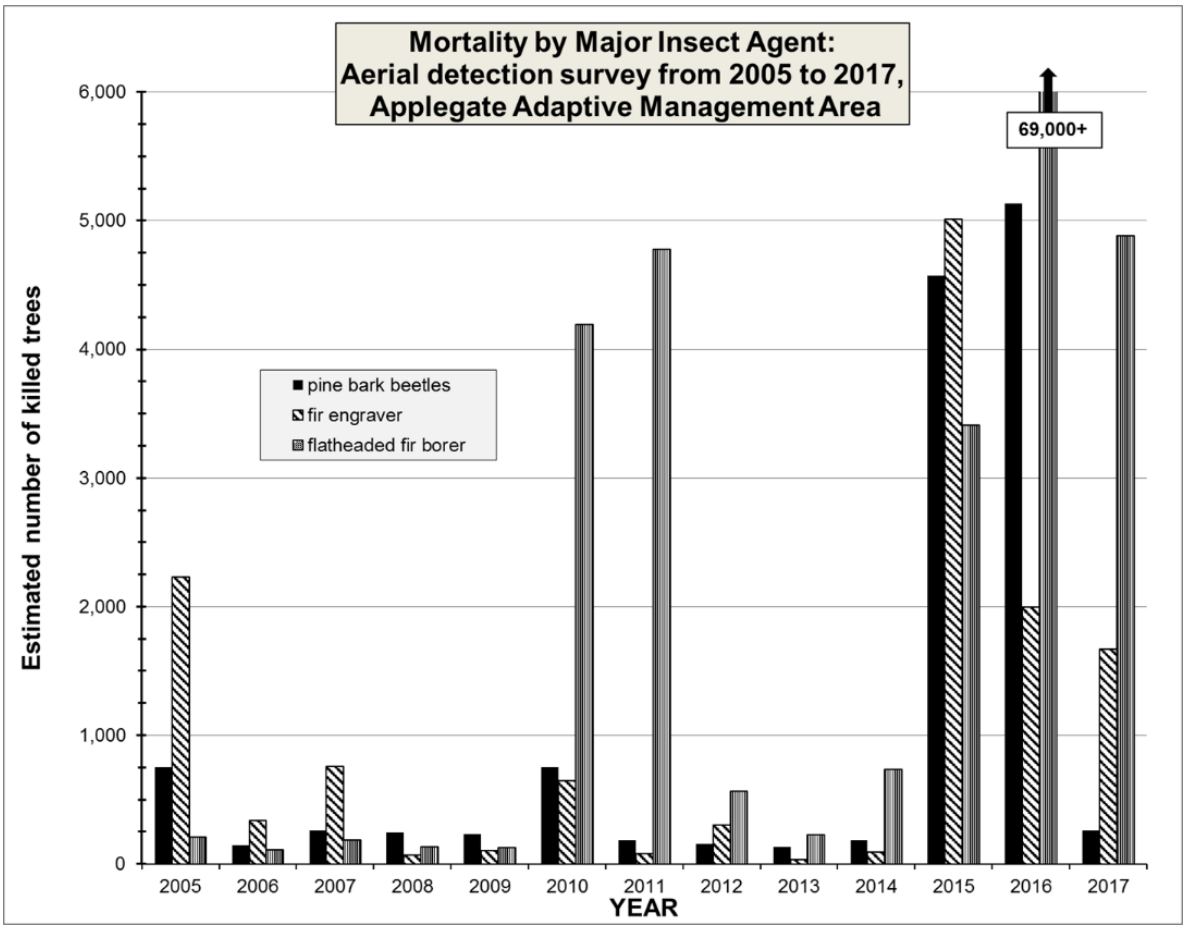
Woodborer Beetles

Woodborer species in conifers occur in three families of beetles and one of wasps. Almost all feed exclusively on dying and recently dead material and are prominent members of the decomposition guild or "clean-up crew". However, one woodborer beetle species in the family Buprestidae in the analysis area is known to kill stressed hosts and, at times, hosts that appear to be heathy.

The flatheaded fir borer, *Phaenops drummondi*, is the primary source of conifer mortality in the entire Applegate watershed, as the following chart of aerial detection survey data illustrates (Figure 1. Data source: https://www.fs.usda.gov/detail/r6/forest-grasslandhealth/insects-diseases/?cid=stelprdb5286951).

Flatheaded fir borers infest stressed hosts and are capable of surviving for several years within them, eventually either killing the tree or being killed themselves. They are especially active in dense Douglas-fir stands at low elevations, on drier aspects, and on harsh sites. Flatheaded fir borer activity is associated with drier than normal years and especially with several consecutive years of droughty conditions accompanied by above average temperatures. Flatheaded fir borers infest Douglas-fir of all sizes and frequently kill trees in groups.

Figure 1. Aerial detection survey results for the Applegate watershed.



Although detected as a tree-killing species as early as 1899 (Hopkins 1899) and mentioned occasionally in the entomology literature, very little research has been conducted on the flatheaded fir borer. Perhaps this is because its activity as a mortality agent has been episodic and, until the early 1970s, significantly underestimated in southwest Oregon. At that time, in response to a drought-induced episode of Douglas-fir mortality in southwest Oregon, state and federal entomologists discovered the mortality previously attributed to Douglas-fir beetle was actually due to the flatheaded fir borer. Recent work from the Southwest Oregon Forest Insect and Disease Service Center (USDA Forest Service, Forest Heath Protection) working with others has yielded more biological details and an estimation of risk factors.

Modelling work correlating aerial detection survey observations of borer-caused mortality with weather, solar radiation, and habitat features indicated that flatheaded fir borer impact is best predicted by elevation at or below 3,500 feet and low available water storage capacity, a combination of soil characteristics and precipitation. The map of Upper Applegate watershed available water storage (Figure 2) shows that a majority of the analysis area has low to very low water storage capacity. Areas with low to very low water storage capacity have and will continue to experience significant amounts of stress, especially during and just after drought periods, and vegetation unable to sustain such dry conditions will fail. Much of this seems to be Douglas-fir, mortality of which is due mostly to flatheaded fir borer. Note that in Figure 1, significant droughts occurred from 2007 through 2009 and in 2013, along with elevated temperatures, and subsequent years show highly elevated levels of mortality from flatheaded fir borer.

Dwarf Mistletoes

Dwarf mistletoes (*Arceuthobium* spp.*)* are parasitic flowering plants. Several species occur in the analysis area and each is host-specific. The species on Douglas-fir, *Arceuthobium douglasii*, is of special concern. Dwarf mistletoes cause decreased growth, stem and crown distortion, and, in some cases especially with Douglas-fir dwarf mistletoe, tree mortality. They also result in tree forms that are preferred nesting habitat for the northern spotted owl and other species of concern. This disease can reach high levels in stands with major host components and infected overstories above developing understories and eventually may cause a local shift in species composition by reducing the amount of Douglas-fir. In areas where Douglas-fir occurs in a multi-storied stand structure, increases in Douglas-fir dwarf mistletoe have occurred. Dwarf mistletoe effects are minimized in single-storied stands, stands where infected overstories are removed before understories become infected, and stands with major components of non-hosts. Stress from disease provides opportunistic insects additionally weakened hosts to infest.

Root Diseases

Several fungal root diseases are found in the analysis area. The most common are Armillaria root disease, cause by *Armillaria* spp., and Heterobasidion root disease, caused by *Heterobasidion occidentale*. Armillaria root disease can occur on any conifer species, yet has its greatest effect on white fir, Douglas-fir and oaks; Heterobasidion root disease affects all true fir with its greatest impact to white fir in the analysis area. Both root diseases cause host mortality and butt rot and both are diseases of the site. The pathogens survive for decades in the roots of infected stumps and dead trees. New hosts are infected when their roots grow into the vicinity of old infected. Heterobasidion root disease is also spread by windborne spores that land on and colonize recently created stumps or wounds. All root diseases are favored in stands with significant host components, especially those near diseased areas with high inoculum levels. Armillaria root disease is favored by host stress. Increases in Douglas-fir and white fir in the analysis area resulting from fire exclusion and past management practices have favored root disease organisms. Root-diseased trees are more attractive to bark beetle attack. Root disease effects are minimized in vigorous stands that contain major components of non-hosts.

Under the current condition, many stands in the analysis area are and will remain densely stocked and therefore will continue to be susceptible to pine bark beetle and flatheaded fir borer infestation. In the absence of fire or management actions reducing stocking, stand densities over time will continue to increase over the already high levels that exist, further elevating the likelihood of insect- and disease-caused mortality. Insect-caused mortality will continue to occur or will increase in the Dry White Fir, Moist Douglas-fir and Dry Douglas-fir Plant Association Groups (PAGs) and would be particularly substantial in the latter. Some kinds of stands, stand components, and individual trees will be especially hard hit including the densest stands with

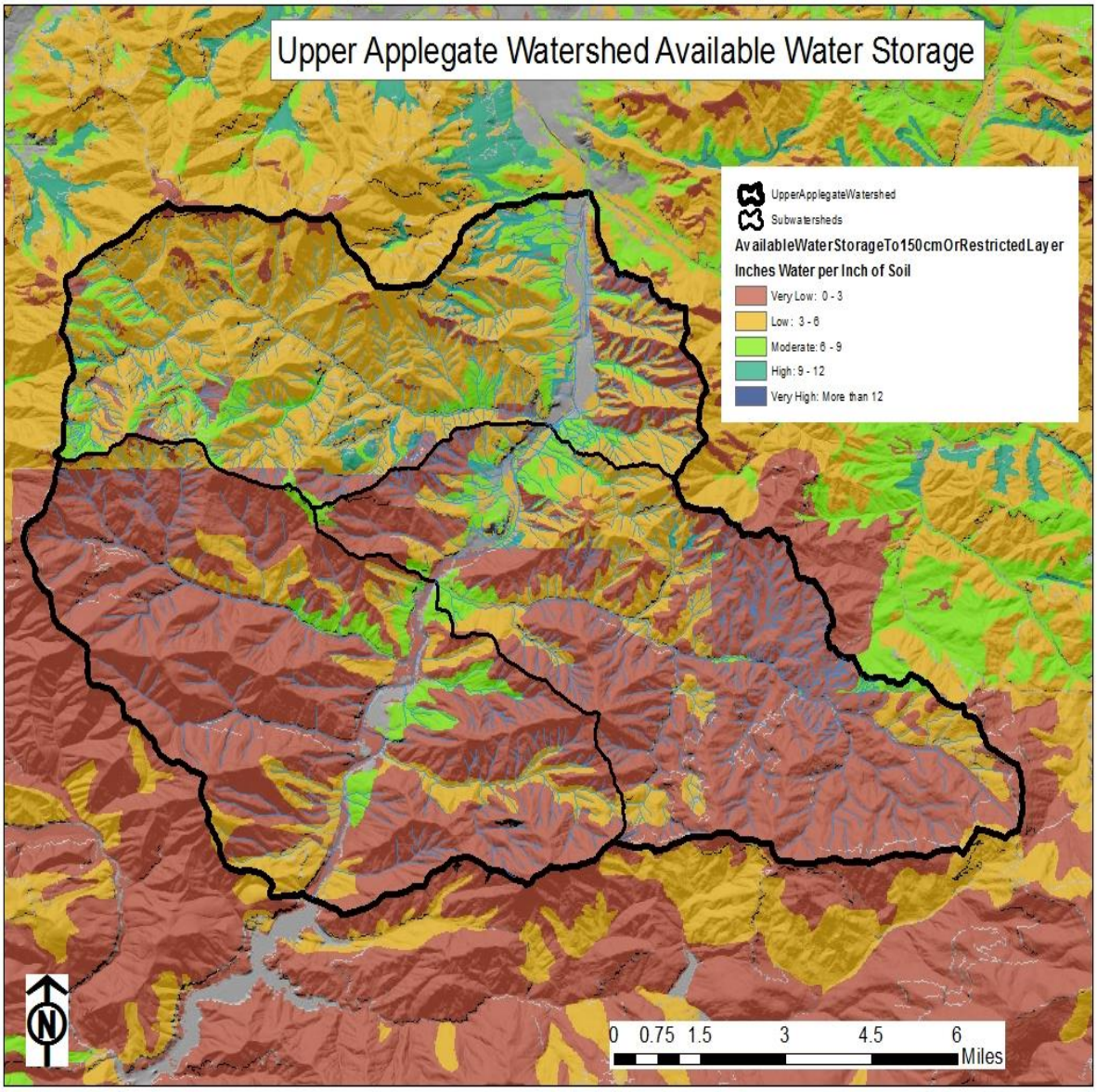
pine components, dense Douglas-fir stands below 3,500 feet in elevation, and large heritage pine and Douglas-fir surrounded by dense understories.

Probability of Tree Mortality

Several factors contribute to the probability of insect- and disease-caused tree mortality in the analysis area. Some of the most significant of these factors are as follows, in relative order of importance:

1. Stand density - Dense stands have a higher probability of bark beetle and woodborer activity than more open stands. They are more likely to experience mortality due to stress-related diseases. In general, for trees greater than five inches in diameter at breast height in stands, basal areas above 120 square feet per acre are at high risk or an elevated probability of mortality; stands above 150 square feet per acre are at very high risk; and those stands at or above 200 square feet per acre are at extreme risk of significant mortality due to insects and diseases. An acre of land has only so much capacity to sustain trees and when this is exceeded, tree mortality from insects and diseases is eventually a likely "symptom". Quoting Main and Amaranthus (1996), "Density reduction of understory conifers and hardwoods is critically important to maintain larger diameter conifers in the lower elevations of the Applegate watershed."
2. Species composition – Stands with major pine, white fir and/or dwarf mistletoe-infected Douglas-fir have higher probability of experiencing insect- and disease-caused mortality than stands lacking such components. Pines, especially sugar and ponderosa, are especially vulnerable to insect attack in dense stands in the analysis area.
3. Proximity to areas of known recent insect- and disease-caused mortality – Already infested stands or stands close to areas of recently detected insect- and disease-caused mortality have a higher probability of experiencing additional mortality than do areas distant from such locations. Aerial detection and ground surveys can locate such areas.
4. Site quality and available water storage – Many stands in the analysis area have low or very low available water storage capacity that stresses or limits vegetation (Figure 2). During and just following drought, especially when accompanied by above average temperatures, such harsh sites tend to incur higher likelihood of experiencing bark beetle-, woodborer- or dwarf mistletoe-caused mortality.
5. Elevation – Stands on sites at elevations below 3,500 feet have a higher probability of experiencing bark beetle and especially woodborer-caused mortality than stands at higher elevations in the analysis area.

Figure 2. Available water storage for the Upper Applegate watershed.



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The mortality of large heritage ponderosa and sugar pines from pine bark beetles is occurring at a rate that exceeds replacement. This is primarily in response to high stand densities created by the abundance of more shade tolerant tree species such as Douglas-fir and white fir. Many of these shade-tolerant trees established during cooler, wetter conditions that ended sometime in the mid-19th Century, followed by warmer, drier weather patterns and an increasing lack of disturbance due to fire exclusion and past management practices. This ingrowth created competition and stress that reduced pine resistance to bark beetle infestation by lowering host vigor and maintaining habitat conditions favorable to beetle success (Fettig and others 2007). Experience by Forest Health Protection entomologists, backed by research, have developed basal area thresholds above which there is an elevated probability of pine bark beetle infestation in southwest Oregon. For trees greater than five inches in diameter at breast height (DBH), these thresholds are as follows:

- Ponderosa Pine - poor to moderate quality sites = 80 ft^2/acre
- Ponderosa Pine - high quality sites = 120 -150 ft^2/acre
- Sugar or Western White Pines on Ultramafic Soils = 80 ft^2/acre
- Sugar or Western White Pines on Non-Ultramafic Soils = 140 - 180 ft^2/acre

Elevated probability of infestation can exist of years without incident or may be realized soon, especially if an epidemic bark beetle population is nearby. In some ways the current condition is one of a "diffuse" pine bark beetle epidemic, in that spatially isolated individual and small groups of large ponderosa and sugar pines are located and killed every year, detected by aerial survey and ground monitoring. This is the case even though few portions of the analysis area have a high proportion of pines outside plantations. Although not comparable in numbers to intense mountain pine beetle epidemics in lodgepole pine that produce massive numbers of dead trees, the current situation in the analysis area is characterized by mass attack and mortality on these increasingly few, yet highly desirable legacy pines.

In addition to mortality of large pines, low regeneration by these legacy trees and other pines is also a function of the lack of disturbance and the high stand densities in which they currently exist. Successful regeneration of pines requires more sunlight and open stand conditions than Douglas-fir and white fir. In addition, the devastating impact of white pine blister rust killing young sugar and western white pines further reduces the chance of successful regeneration by those species. White pine blister rust is an introduced disease caused by the fungus Cronartium ribicola that was accidentally introduced to the West Coast in 1910 and rapidly spread. In addition to killing young 5-needle pines, white pine blister rust causes branch flagging, top kill, and renders large infected trees more susceptible to mountain pine beetle attack. The initial, long-standing preference for logging sugar pine, combined with the impacts of white pine blister rust, mountain pine beetle, and high stand densities has reduced their population and placed sugar pine in a precarious position.

Due to the lack of pine regeneration and the dense stand conditions in the analysis area, mortality of mature Douglas-fir and white fir is currently followed by subsequent generations of these same shade-tolerant species rather than pines. Many of these shade tolerant trees find themselves now in locations and under weather patterns that are less favorable for growth and survival than during prior eras.

Mortality of Douglas-fir at lower elevations in the analysis area, primarily caused by the flatheaded fir borer, accounts for the largest proportion of recent tree mortality in the analysis area (Figure 1).

Douglas-fir mortality due to flatheaded fir borer is ongoing in the analysis area in managed and unmanaged stands and this increases significantly following drought. Thinning in Douglas-fir dominated stands including heavy thinning from above has generally resulted in increased growth, better survival, and improved resilience to perturbations such as drought in the remaining trees. A well-documented example of this is the 17 year study of the Grubby-Sailor Timber Sale administered by the Bureau of Land Management (Main and Bennett 2018). Indeed, thinning in Douglas-fir is a widely proposed tactic to improve resilience to drought and a drier, warmer climate (for examples, see D'Amato and others 2013; Kolb and others 2016). From this perspective, it appears that the mortality due to flatheaded fir borer serves to reduce the high density of Douglas-fir on sites where it is or is becoming less well adapted. This mortality may contribute both snags and large fuels. Density reduction of Douglas-fir is ongoing in the analysis area but not currently at a scale and pace that will substantially reduce the level of insect-caused mortality nor is it likely to improve available water storage or other conditions contributing to this mortality on harsh sites.

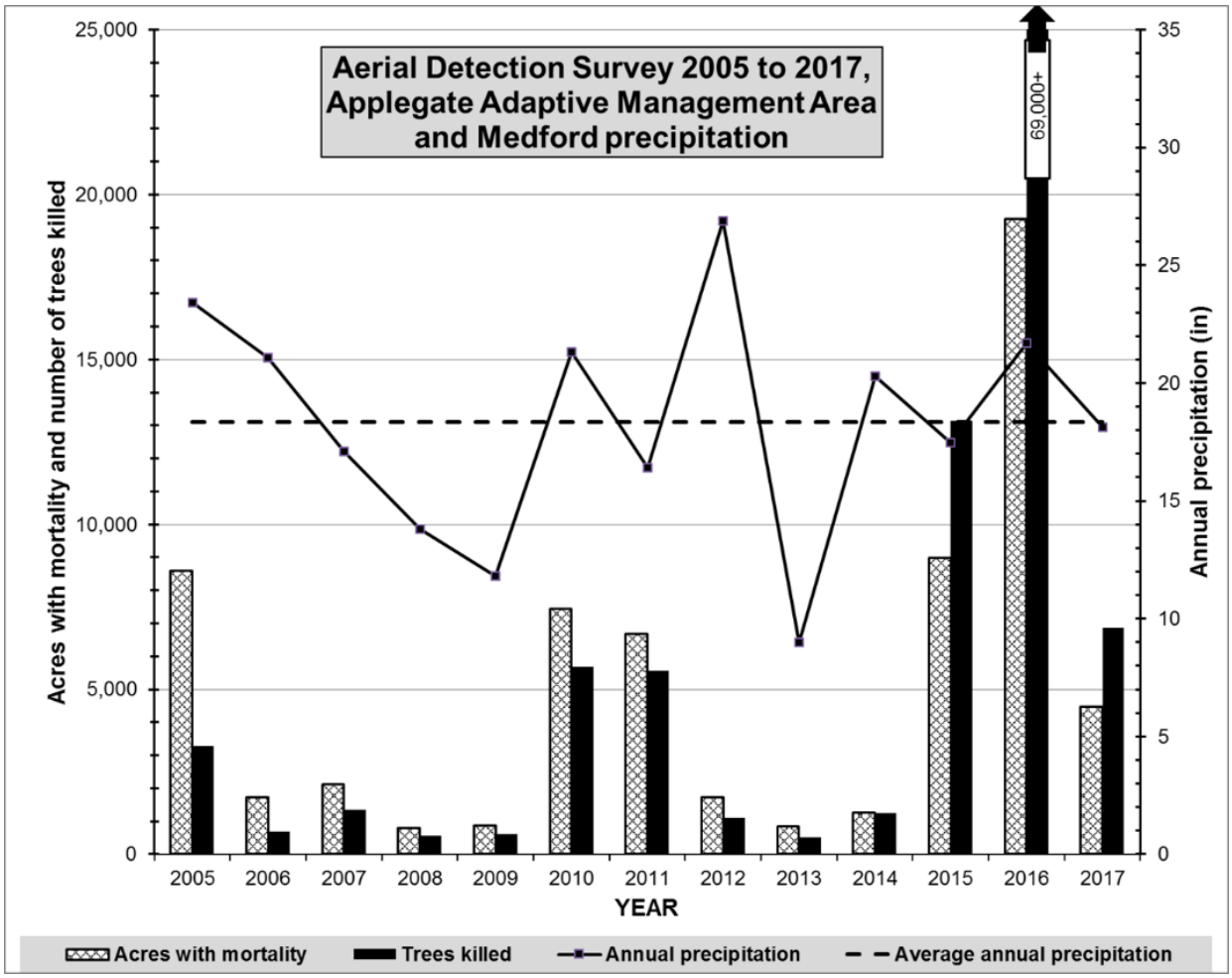
Insect-caused mortality has increased during and especially just following drought, as Figure 3 illustrates, and this increase has been substantial. The interaction between high stand density, higher than average air temperatures and drought further enables this mortality. Droughts appear to be more frequent and severe, as well. Although most of the mortality in Figure 3 is attributed to flatheaded fir borer in Douglas-fir, both pines and white fir die at a faster rate associated with drought, as previously stated. It is assumed that a drought and especially a severe drought accompanied by high temperatures such as occurred in 2013, for example, injures the trees such that recovery requires more than simply the return of average or above amounts of annual precipitation (Young and others 2017). Such drier, warmer periods are often accompanied by increased fire activity.

If the analysis area were to burn in a large-scale, high intensity wildland fire, there will be insect ramifications. Fire-injured trees not killed outright would likely become more susceptible to attack by bark beetles, flatheaded fir borer and the "clean-up crew" of wood boring insects. Substantial infestation of such injured pines and Douglas-fir would be expected. It could be that green trees in adjacent stands surrounding fire-affected areas may experience increased insect activity due to contagion, although this is far more common east of the Cascade crest. It is most likely in areas where insect populations are already at elevated levels. While difficult to predict if this will occur to any significant degree, based on monitoring post-fire mortality in southwest Oregon, it usually does not happen. Some similar activity is expected in intensely burned portions where mixed severity fires occur. Low intensity fire has the potential to reduce shade tolerant tree seedlings and other vegetation and cause some density reduction while not attracting opportunistic insects. Areas deliberately burned under prescription may have some delayed mortality due to insects, yet this has been a relatively uncommon observation currently in the analysis area and is likely to occur at very low levels dictated by the amount of crown and cambium injury. Density reductions created by fire have alleviated the high density in some stands in the analysis area particularly where thinning has preceded those fires.

Under the Proposed Action, a significant decrease in vegetation density in treated areas is expected due to the use of prescribed fire, thinning, and a combination of these actions in managed and unmanaged stands. These density reduction actions will lower the probability of tree mortality from pine bark beetles both directly by creating more open habitats less favorable to bark beetle success and indirectly by improving host vigor through reduced competition for light and nutrients.

It is believed that in most stands, density reduction in Douglas-fir dominated areas will reduce subsequent mortality from flatheaded fir borer. Proposed actions to create mosaics of age classes, density, and species composition would create less homogenous conditions that will mitigate against population increase and large area impacts from these relatively host-specific insects and tree diseases.

Figure 3. Tree mortality from 2005 through 2017 in the Applegate watershed.

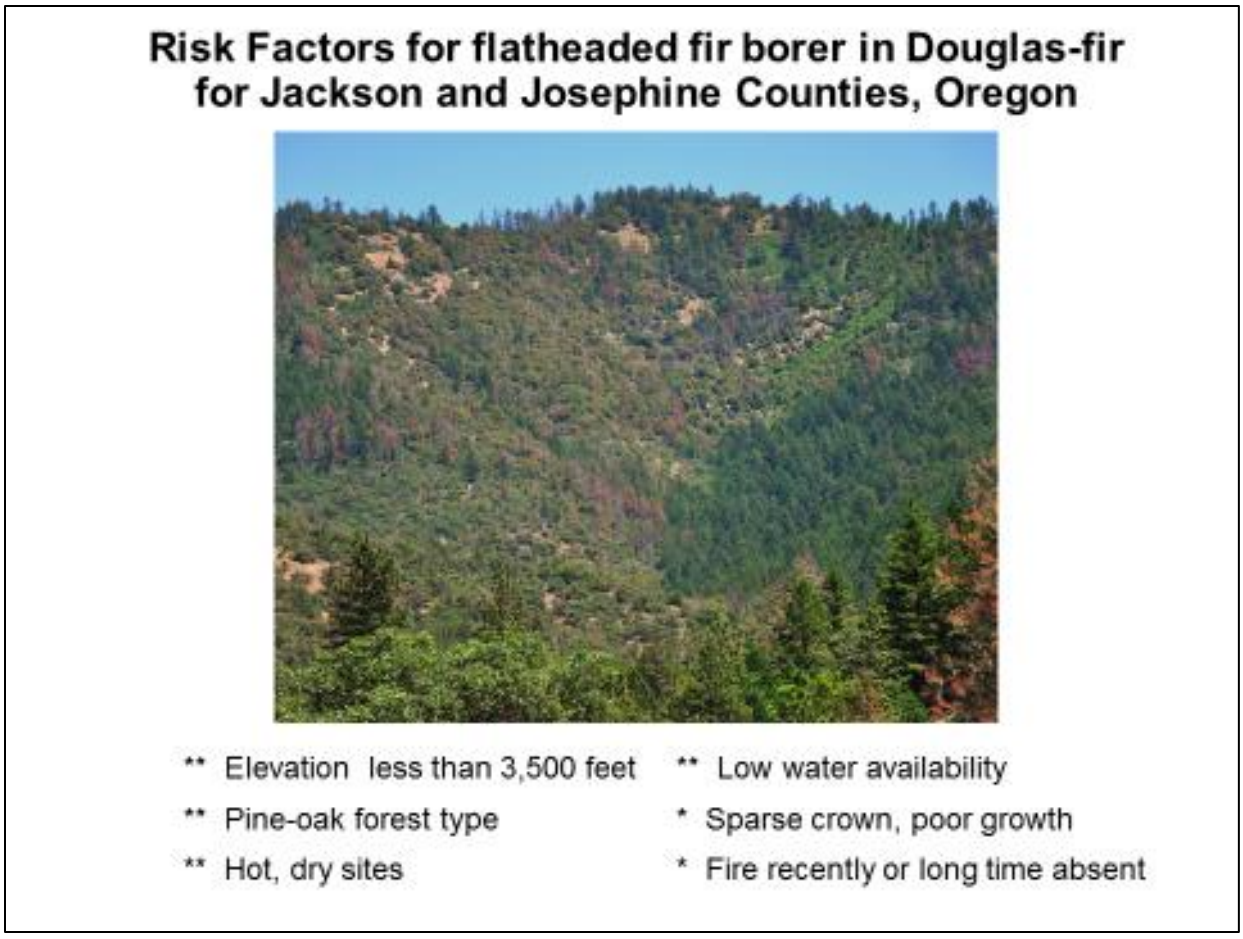


Thinning around legacy trees has the potential to at least stabilize growth and slow decline, while at best to increase their growth rate, vigor, and lower the probability of successful bark beetle attack. Either individual legacy trees or groups of legacy trees operating as an individual need sufficient space to accomplish this. The exact size required for an opening for individual tree culturing is not well researched. However, recent research has shown that attempts to increase vigor of legacy trees while still maintaining closed canopy in dry, coniferous forest types by reducing stand density only around the immediate neighborhood of legacy trees will likely be unsuccessful if the radius is not greater than 30 feet (Hood and others. 2017). The basal area guidelines noted earlier relative to density and bark beetle risk are suggested for stands or stand components.

The proposed treatments are likely to promote some regeneration of pines, especially with density reduction activity followed by prescribe fire. However, planting rust resistant sugar pine from the appropriate seed zone will increase the chance of regeneration survival and replacement of mature sugar pine, while amplifying rust-resistant genetic combinations found in the field and strengthened through traditional plant breeding techniques. Together with thinning around legacy sugar pine to mitigate losses, this has the potential to return sugar pine to the position it historically occupied in the long term and provide for the restoration of this important and challenged species.

Variable density thinning in areas dominated by Douglas-fir will reduce losses to flatheaded fir borer in areas with sufficient available moisture to support the residual trees. However, it is those areas that are less likely to incur such mortality currently. Risk factors associated with flatheaded fir borer in Douglas-fir, developed by the Southwest Forest Insect and Disease Service Center and others, are illustrated in Figure 4. Note the significant edge effect at ecotone transitions, especially into areas dominated by white oak, where Douglas-fir mortality due to flatheaded fir borer is particularly significant. Under the proposed action, mortality of Douglas-fir due to flatheaded fir borer will not be eliminated. This is because increasingly warmer temperatures and future hot droughts will amplify stress from low soil water holding capacity and continue to render Douglas-fir at lower elevations highly susceptible to attack. From one perspective, the Proposed Action and the action of the flatheaded fir borer both will serve to reduce the high density of Douglas-fir in locations where it is less well adapted to current and future conditions.

Figure 4. Risk factors associated with flatheaded fir borer in Douglas-fir



Such tree mortality increases fuel loading and may contribute to a wildfire. An intense and severe wildfire will injure some trees such that a short term pulse of insect-caused mortality will follow for a few years in addition to those trees killed outright by fire. In the longer term, such a wildfire will remove many potential host trees, so that insect- and disease-caused tree mortality will be very low.

Under the current condition and Proposed Action, the only activities that would cumulatively occur on the same acre are density management and maintenance prescribed burning. In each instance either alone or in combination, repeating these density reduction actions would contribute to an overall decrease in the probability of mortality due to forest insects and tree diseases. Assuming these actions increase the spatial vegetative diversity, future tree mortality may be lowered due to breaking-up concentrated areas dominated by one species where these host-specific mortality agents may more fully exert their influence. An exception could be if prescribed fires sufficiently injure trees such that delayed mortality due to insects follows and this is repeatedly implemented.

Density management and maintenance prescribed burning will continue at the current pace with episodic increases in tree mortality associated with drought and especially drought accompanied by higher than average temperatures. Resilience to perturbations will remain relatively low due to the pace and scale of activity, the high density of existing stands, and the continual increase in density due to growth that greatly exceeds mortality. The longer a stand carries the high tree density that elevates the probability of mortality from bark beetles, the more likely this risk is to be realized. Lacking treatment, the chance that a wildfire will provide insect and disease-causing organisms additional opportunities will continue.

A significant decrease in vegetation density in treated areas is expected due to the use of prescribed fire, thinning, and a combination of these actions in managed and unmanaged stands. While drought and especially hot droughts will be associated with additional tree mortality due to insects and diseases, resilience to perturbations will be increased. A cumulative effect of repeated density reduction and prescribed fire activity on the same acres will render those areas less likely to become overstocked and may favor regeneration of shade intolerant pines. An accumulation of treated stands at lower risk to bark beetle mortality due to density reduction will eventually provide a landscape scale reduction in such losses, adding further resilience and possibly increasing longevity of isolated legacy pines. Planting rust-resistant sugar and western white pine will have the cumulative effect of increasing the population resistance to white pine blister rust. Because Heterobasidion root disease is spread by windborne spores that land on and colonize recently created stumps or wounds, untreated fir stumps and large wounds that become infected will increase the inoculum load in an area. These infected fir will then serve as sources of additional inoculum, the larger the root mass the more inoculum, and eventually increase mortality of true fir. Planned density reduction including ladder fuel treatment and the return of repeat low intensity fire to the analysis area should lower the probability of intense and severe wildfire. This will greatly reduce the short and longer term effects of wildfire described above --- some tree killing insects would at first flourish then be absent for many years in portions of the area burned severely.

B. CLIMATE CHANGE

Climate change is expected to profoundly alter vegetation structure and composition, terrestrial ecosystem processes, and the delivery of important ecosystem services over the next century (Peterson et al, 2014).

According to the latest Intergovernmental Panel on Climate Change report (AR5), each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850. The globally averaged combined land and ocean surface temperature data as calculated by a linear trend show a warming of 1.53°F over the period 1880 to 2012 (IPCC, 2014).

In the Northwest, temperatures increased across the region from 1895 to 2011, with a regionally averaged warming of about 1.3°F (Mote et al, 2014). Projected annual temperature increases in southwest Oregon are expected to average around 7.56°F with a projected summer increase of around 9.36°F and a decrease in summer precipitation of up to 30% by 2100 (Halofsky et al, 2016).

With an increase in temperatures and changes in precipitation patterns some of the current major impacts and future predictions expected in the region include, but are not limited to (Myer et al, 2013):

- Reducing snowpack accumulation possibly to 20% of historical patterns by late century
- Shifting precipitation patterns with heavier downpours
- Shifting precipitation from snow at high elevations to rain
- Earlier snowmelt, and melting glaciers
- Earlier peak in stream flow
- Reducing stream flow in late summer and fall
- Increasing flooding especially in winter and spring
- Degrading water quality/quantity (warmer rivers and oceans, water borne illness,)
- Increasing frequency and severity of heat waves and droughts
- Increasing frequency, severity, extent, and duration of wildfires
- Increasing extreme weather events (storms, blizzards, etc.)
- Increasing spread of human and crop pathogens, parasites and diseases
- Changes in forest productivity patterns due to the above
- Changes in seasonal climate patterns disrupting natural ecosystem function
- Critical threshold events that would impact wildlife (floral and faunal) species and potentially increase extinction rates.

Climate change modeling projections for future vegetation communities suggest that the range of lower elevation grasslands, chaparral and montane forests are likely to expand while higher elevation alpine and subalpine forests are likely contract under a warming climate scenario (Halofsky et al, 2016). Hotter summer temperatures, less snow pack and drier summers, all conditions linked to large fire years would likely lead to an increase in fire frequency, duration and possibly severity of wildfires in southwest Oregon. Modeling has also projected and annual increase in very large fires (>12,000 acres) in the western United States of up to a factor of 4 for the years 2041-2070 when compared to their occurrence from 1971-2000 (Barbero et al, 2015).

In fire prone ecosystems such as southwest Oregon, fire is a natural process that shaped the landscape for millennia. However, amplification of this process do to climate change could put vulnerable species and habitats at a greater risk to loss and undesirable future conditions. Fire patterns have been shown to repeat or self-reinforce fire intensity in re-burned areas leading to type conversions from forested to non-forested vegetation (Coppelatta et al, 16; Perry et al, 2011; Grabinski et al, 2017).

This self-reinforcing pattern emphasizes the importance of improving stand resiliency and reestablishing a low/mixed severity fire cycle as a means of mitigating future high severity fire. Altering conditions so that disturbance processes can act to increase, rather than reduce, forest heterogeneity may provide ecosystems with the ecological flexibility to withstand and persist through future changes in climate and climate-related processes (Coppelatta et al, 16).

The Proposed Action includes management approaches in the face of potential increases in temperature and decreases in precipitation and snowpack accumulation. These management actions focus on the restoration of physical and biological processes and patterns that create and maintain diverse networks of habitats for plant and animal populations. Treatments focusing on low elevation oak and pine savanna coupled with prescribed fire and native plant enhancement would improve the integrity and resiliency of these systems. Treatments would also include managing forest densities through commercial and non-commercial thinning for reduced susceptibility to drought stress and using prescribed fire to reduce susceptibility to high-intensity, large disturbances.

These strategies were identified for the Upper Applegate watershed and consistent with the following restoration strategy recommendations from the Synthesis of Science to Inform Land Management within the Northwest Forest Plan Area (Spies et al, PNW-GTR-970, 2018)

Restoration Strategies for Cultivating Resilience to Climate Change and Fire

- Variable-density or low thinning in plantations in moist and dry forests to increase ecological heterogeneity and accelerate growth of large trees and tree crowns.

- Variable-density or low thinning along with prescribed fire in burning older forests in very frequent/low-severity and frequent/mixed-severity fire regime forests. These would be done to increase resilience to fire and climate change by restoring diverse and fire-tolerant structures and compositions of older forests, and of other successional stages, that would ultimately succeed to old-forest conditions.

- Careful use of prescribed fire and managed wildfires in fire-prone low- and mixed-severity fire regime forests to restore key ecological processes while protecting critical areas of dense, older forest conditions and other values that may not be resilient to fire.

- Creating diverse early-successional habitat where feasible, given other ecological goals and social constraints. The strategy for doing this could include variable-retention silviculture and prescribed fire in plantations and in forests more than 80 years old. Such practices are allowed in the NWFP in the matrix and may be appropriate if they are consistent with other landscape goals (e.g., creating or maintaining resilience to fire and climate change, providing habitat for spotted owls, and creating landscape-scale successional diversity).

- Using landscape-level management and conservation principles based on disturbance regimes, topography, species-specific climate refugia, spatial pattern, and departure from desired historical conditions.

- Management actions that promote resilience to wildfire and drought in fire-prone forest landscapes include thinning and prescribed fire to promote growth and restoration of large fire-resistant trees; reducing the vertical and horizontal continuity of forest fuels; restoring the patchwork of open and close canopy forests and tailoring these conditions to topography; and strategic work in forests with native diseases and insects to promote heterogeneity. These actions would promote a more desirable mix of low-, mixed-, and high-severity fires on the landscape.

There is agreement that the forestry sector contribution has declined over the last decade (IPCC, 2014; Smith et al., 2014; FAOSTAT, 2013). The main activity in this sector associated with GHG emissions is deforestation, which is defined as removal of all trees, most notably the conversion of forest and grassland into agricultural land or developed landscapes (IPCC 2000).

This restoration project does not fall within any of the main contributors of greenhouse gas emissions. Forested land would not be converted into a developed or agricultural condition. In fact, forest stands are being retained and thinned to maintain a vigorous condition that supports trees, and sequesters carbon long-term. US forests sequestered 757.1 megatonnes[1] of carbon dioxide after accounting for emissions from fires and soils in 2010 (US EPA, 2015). However there is growing concern over the impacts of climate change on US forests and their current status as a carbon sink. There is strong evidence of a relationship between increasing temperatures and large tree mortality events in forests of the western US. There is widespread recognition that climate change is increasing the size and frequency of droughts, fires, and insect/disease outbreaks, which would have major effect on these forests' role in the carbon cycle (Joyce et al. 2014).

2. ANALYSIS OF EFFECTS – Relevant Issues

Relevant Issues presented in Chapter 1 of the Environmental Assessment are being addressed because of the extent of their geographic distribution, the context of associated consequences, the duration of the effects, or the intensity of interest or resource conflict. Effects of implementing the Proposed Action are compared against the current condition and the consequences of not implementing the Proposed Action.

The subsequent discussion of effects begins with background information on the affected environment pertinent to relevant issues followed by a presentation of direct, indirect and cumulative effects associate with the relevant issues.

A. BOTANICAL POPULATIONS AND HABITATS

Activities associated with restoration treatments and new trail development, along with other connected actions, may affect the viability and resilience of native botanical species, in particular the Endangered *Fritillaria gentneri*, and habitats, including Forest Service Sensitive species.

Portions of the Upper Applegate watershed were surveyed for the Upper Applegate Road Hazardous Fuels Reduction project in 2009. A geospatial analysis of the remaining area was carried out to determine if suitable habitat potentially exists in unsurveyed areas. High priority and suitable sensitive plant habitat was identified and slated for surveys. Surveys for rare, sensitive, and survey and manage species were carried out in 2017. Consistent with the recovery plan two -year years of surveys for *Fritillaria gentneri* were completed in April/May 2017 and 2018.

Threatened and Endangered Plant Species

Fritillaria gentneri is an endangered (Federally and State listed as Endangered) plant species that is found within the project area, including within one proposed underburn unit. It is a member of the Lily Family (Liliaceae) and is found in a limited area of southwestern Oregon, with one known population in California.

[1] A megatonne is one million metric tons of CO_2; equal to about 2.2 billion pounds.

The species has a narrow worldwide distribution. It is confined within the Rogue and Applegate River Valleys in southwest Oregon. The epicenter of the species distribution is around Jacksonville, Oregon. The upper Applegate River is home to only a few scattered populations with limited individual flowering plants found at those sites. *F. gentneri* generally occurs in dry, mixed woodlands of Douglas-fir, California black oak, and/or Oregon white oak at lower elevations often in transition zones between plant communities. *F. gentneri* plants do not flower every year and non-flowering plants look like the common species, *F. recurva*.

Fritillaria gentneri is the only federally listed plant that has been found on the Siskiyou Mountains Ranger District and Ashland Resource Area. Two populations were known to occur on Forest Service lands within the Upper Applegate watershed prior to surveys. One new population was located during surveys in 2018. Additionally, two populations were known from proposed units on Ashland Resource Area lands. The majority of known sites of this species are located on privately owned lands and lands managed by the Bureau of Land Management.

Table 2. Summary of Effects to *Fritillaria gentneri* and habitat

Scale	Mechanism for Effect	Cause & Effect Relationship	Effects Call	Rationale
Fritillaria gentneri individuals	Trampling during cut & piling work, stacking piles on site, burning piles on individuals, high severity Rx fire.	Leave area/buffer PDC is meant to remove mechanisms that would cause effects. Therefore direct and indirect effects are not anticipated.	NE	One population with one flowering individual found in the lower portion of Unit 8, just above the Beaver Creek Road.
Fritillaria gentneri populations	None, expected to promote a beneficial mechanism for effects.	Action would increase flowering plants at three populations.	NLAA	This implements the recovery strategy for the species and would result in more stable populations over the long term.
Fritillaria gentneri habitat	High severity Rx burning in habitat that removes or transitions it into alternative seral states such as increasing invasive plant cover.	Fritillaria Management Area (FMA) guidance to be followed within suitable habitat, reducing potential cause for negative direct or indirect effects	NLAA	Five FMA's would be designated across the RR-SNF. Three of them fall within this project area. FMA's would result in management of habitat that limits effects and is meant to benefit the species.
Effects Call: NE = No effect, NLAA = May Affect, but Not Likely to Adversely Affect				

In accordance with section 7(a)2 of the Endangered Species Act of 1973, as amended, the Rogue River-Siskiyou National Forest has requested informal consultation on this action. A Biological Assessment (BA) has been prepared and sent to the US Fish and Wildlife Service (USFWS) for concurrence on effect calls for the endangered plant *Fritillaria gentneri*. The RR-SNF is also working very closely with the USFWS to recover *F. gentneri* by taking a proactive approach by developing Fritillaria Management Area's (FMA). These FMA's would guide management within high suitable habitat for this endangered plant species. The three FMA's that fall within this planning area would provide valuable habitat characteristics for the furthest southwesterly known populations of this species.

Sensitive and Survey and Manage Plant/Fungi Species

The following table identifies the seven sensitive and one survey and manage vascular plant species that occur within proposed treatment areas of the Upper Applegate Watershed project. This analysis was planned and conducted based on the Region 6 Regional Forester's and Oregon/Washington State Director's 2015 Special Status species lists. These species/populations were either known from historical survey records or were discovered during analysis for this project. *Porella bolanderi*, a liverwort, was suspected but not known to occur in the Upper Applegate watershed, and was not located during surveys. No sensitive lichen or bryophyte species were discovered during surveys. It was determined during pre-survey analysis and through ongoing field checks that no habitat for Region 6 sensitive fungi is present within proposed treatment units, so those species were not analyzed further. The reason is because the vegetation and necessary climatic conditions are not present in this project area. None of the proposed treatments trigger equivalent effort survey and manage fungi surveys because there is no proposed commercial harvest in forests that would be characterized as "old growth" as defined in the NWFP.

Table 3. Known Sensitive/Survey & Manage Plant Species: Habitat and Locations

Species	Habitat in Upper Applegate Watershed	Area(s) Where Found
Milo Baker's cryptantha (*Cryptantha milo-bakeri* - CRMI)	Dry open gravel like soils on micro-ridges with very low canopy cover.	1 known population PCT/Rx Burn Unit: 81
Clustered lady slipper (*Cypripedium fasciculatum* - CYFA)	Mesic conditions under dense canopied Douglas fir forest, most often on north aspects.	11 known populations Rx Burn Units: 1, 2, 3, 5 & 9 PCT/Rx Burn: 201, 202, 248 Legacy Tree Unit: 41 Commercial Thin Unit: 51
Mountain lady slipper *(Cypripedium montanum* – CYMO) Survey and Manage Category C Species	Occupies same or similar habitat as clustered lady slipper.	1 known population PCT/Rx Burn Unit: 210
Red larkspur (*Delphinium nudicaule* - DENU)	Rocky thin soiled areas within Class 4 streambeds, and within scree and talus on steep slopes.	2 known populations Rx Burn Unit: 6
Bush beardtongue (*Keckiella lemmonii* - KELE)	Arid southerly facing slopes. Occurs in low canopy cover chaparral areas.	3 known populations Rx Burn Unit: 6 Fuels Maintenance Unit: 563
Holly leaf redberry (*Rhamnus illicifolia* - RHIL)	Dense chaparral pockets surrounded by Douglas fir/black oak forest.	3 known populations Rx Burn Unit: 5 & 6 Fuels Maintenance Unit:: 563
Hill suncup (*Tetrapteron graciliiflorum* - _previously known as *Camissonia graciliflora* – CAGR)	Grows on open graminoid and forb dominated balds, usually on clay dominated soils.	2 known populations Rx Burn Unit: 6 & 8
Giant death camas *Toxicoscordion exaltatum*	Found in sparsely vegetated loose talus like soils on upper ridges and saddles.	1 known population Rx Burn Unit: 1

Table 4. Summary of Effects to Known Sensitive/Survey and Manage Plant Species in Proposed Treatment Areas

Species	Mechanism for Effects	Cause and Effect Relationship	Effects Call	Rationale
Milo Baker's cryptantha (*Cryptantha milo-bakeri* - CRMI)	Trampling, burn pile placement, fire line creation.	These mechanisms could result in direct effects but the PDC would eliminate or minimize to negligible any mechanism/cause for effect.	MIIH	A no entry buffer area would be marked on the ground which would remove potential mechanisms that cause negative effects. Rx burning should not have negative effects because the vegetation type where this plant occurs cannot carry high severity fire.
Clustered lady slipper (*Cypripedium fasciculatum* - CYFA)	Host tree removal (mycoheterotropic species), canopy cover reduction, trampling/skidding, pile burn placement	Removing host trees and reducing canopy could cause indirect effects while direct effects from trampling & placing piles on plants could also occur. A PDC is in place to avoid these mechanisms/causes for effects.	MIIH	A no entry buffer area would be marked on the ground which would remove potential mechanisms that cause negative effects. Rx burning should be avoided in most cases. To implement adaptive management it may be useful to experiment with burning at a few populations in order to monitor effects.
Mountain lady slipper (*Cypripedium montanum* – CYMO) Survey and Manage Category C	Same as clustered ladyslipper	Same as clustered ladyslipper	MIIH	Same as clustered ladyslipper, except that because there is only one population there is no potential to implement experimental burning.
Red larkspur (*Delphinium nudicaule* - DENU)	High severity fire, but there is low probability considering the sparsely vegetated areas where this plant grows.	There is not a clear mechanism for effects so there is no expected cause for effects.	NI	There is a very low probability that high severity fire would negatively affect or extirpate populations of this species. The habitat the species grows within does not carry fire.
Bush beardtongue (*Keckiella lemmonii* - KELE)	Increased competition from invasive plants, trampling and cut/pile/pile burning and fireline construction.	This species would benefit from low to mid-severity fire by reducing competition over the long run. However, the habitat this species occupies is very susceptible to indirect effects from invasive plant colonization that could occur after Rx burning. Direct effects could occur from trampling during cut/pile/burn and fireline construction. PDC's to avoid these mechanisms for effects are in place.	MIIH	Backing low to moderate severity fire in and around populations is desired. However fire suppression actions could cause collateral damage, so no entry buffer areas would be marked on the ground. This PDC would remove potential mechanisms that cause direct negative effects. PDC's are in place to minimize the colonization and spread of invasive plants. However, it is impossible to entirely mitigate this threat. Areas in and adjacent to sensitive plant populations would be prioritized for funding early detection rapid response (EDRR) invasive

Species	Mechanism for Effects	Cause and Effect Relationship	Effects Call	Rationale
				plant surveys/treatments to further ameliorate these potential effects.
Holly leaf redberry (*Rhamnus illicifolia* - RHIL)	The main mechanism that could affect this species is inadvertent cutting of it during restoration thinning. Also piling material on seedlings could cause negative effects. There is some potential for invasive plant colonization as well.	Pro-active non-commercial thinning, piling of material and burning is proposed as part of a restoration strategy for this species. Extra care should be taken to ensure individual plants are protected during this work. A botanist should lay out these units with a fuels specialist to ensure mechanisms for effects are reduced to negligible.	BI	Over the past two decades botanists on the Siskiyou Mts. RD have documented continued loss of individuals of this species due to competition from lack of disturbance from fire. Part of the purpose and need for this project is to restore structure and composition that favors biodiversity. EDRR would be prioritized in and around these treatment areas to minimize collateral impacts from invasive plants.
Hill suncup (*Tetrapteron graciliiflorum* - previously known as *Camissonia graciliflora* – CAGR)	Considering the habitat where this plant grows, invasive plant competition is the main mechanism for effects to this species. The graminoid/forb dominated clay soil balds are already heavily invaded by annual non-native grasses.	Rx fire in these habitats is likely to result in short term decreases in invasive annual grasses, followed by long term increases. This species does rely on low severity fire for reproduction and to maintain habitat, so some benefit from Rx burning is anticipated.	MIIH	Due to the high likelihood of increased pressure from invasive plants in these habitats this species is at may impact rather than beneficial impact. The same EDRR PDC used with the above species should be utilized in areas where this species grows. Also, proactive native bunch grass seeding and planting in and around known populations could help abate further impacts to this plant from invasive annual grasses.
Giant death camas *Toxicoscordion exaltatum*	The sparsely vegetated areas where this plant grows naturally minimizes potential mechanisms for negative effects. Constructing fireline and subsequently trampling plants is the main potential mechanism.	Fireline construction along the saddle where this species is growing would be the main cause and effect. Implementing the PDC of no entry buffer would mitigate any potential for this.	MIIH	There is relatively low potential for effects to this species because of where it grows. A botanist should work with the fuels specialist to ensure that firelines are constructed outside of areas where this plant occurs.
Effects Call: MIIH = May adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing, NI = No Impact, BI = Beneficial Impact				

Rafinesquia californica is an annual forb of the dandelion family that inhabits open sites in scrub and woodlands, "often common after fire" (Jepson 2012). It occurs in a number of sites on proposed activity units within the Ashland RA.

The project area encompasses a very biodiverse area relative to rare plant distribution in the state of Oregon. Many of the species in the project area rely on frequent low to moderate severity fire for reproduction and habitat requirements. The purpose and need of the project addresses several of these species by promoting disturbance on the landscape. There is potential for collateral damage to these species from inadvertent actions directly trampling or uprooting individual plants or entire populations. PDC's are outlined in the Environmental Assessment (EA) that provide mitigation from these potential impacts. The greatest ongoing threat to these species in this project area is from continued or exacerbated invasive plant spread. It is very important that during implementation of this project this factor is considered. Botanist's, fuels specialists and interested community members should work closely together to develop prescriptions and strategies to minimize these impacts.

Considering this project is proposed within the Adaptive Management Area land allocation there is potential for monitoring effects from commercial thinning followed by prescribed burning on clustered lady slipper. This would be a good opportunity for collaboration with the local community who helped develop this project over the past several years. Ongoing monitoring and prescription adjustment for all treatments and PDC's should be a long term goal within this AMA land allocation.

There would be no cumulative effects because the only activities that would cumulatively occur on the same acre are restoration treatments, e.g., density management, activity fuels treatments and/or maintenance prescribed burning.

B. RECREATION

Activities associated with restoration treatments and new trail development, along with other connected actions, may affect the quality (user experience) of recreation or change public use of recreation facilities and may affect the safety of the recreating public.

The Upper Applegate Watershed offers a diverse mix of recreational opportunities including developed recreation sites, motorized and non-motorized trails, fishing, hunting, berry and mushroom picking, botanizing and dispersed camping. Recreation use occurs in this area all year long and ranges from a low level of use in the winter to a moderate level of recreational use in the spring, summer and fall. In the winter the Applegate Valley is often sunny and warm while the Rogue Valley has heavy fog and is cold, which makes for a great outdoors escape.

The Forest Service uses a method called the Recreation Opportunity Spectrum (ROS) to inventory and manage outdoor recreation settings and to insure that a broad mix of these settings remain available to provide the recreating public. Experiences are on a continuum and range from high challenge and remoteness (Primitive) to highly developed and managed settings found in some Forest Service recreation areas (Urban).

Under the RRNF LRMP approximately half of the Upper Applegate watershed has been assigned an ROS of Semi Primitive Motorized and half as Roaded Natural and Roaded Modified (see Figure 5).

A Semi Primitive Motorized ROS is characterized by a predominantly natural-appearing environment with a low concentration of use, but there is often evidence of other users. Motorized use is permitted and access is via motorized trails or primitive roads.

Similar to Semi Primitive Motorized ROS, Roaded Natural and Roaded Modified ROS classes are characterized by a predominantly natural-appearing environment, but with a moderate to heavy evidence of other users. Access is by foot, horse, mountain bike, and motor vehicle. The Upper Applegate watershed is characterized by a well-developed system of roads (generally gravel surfaced) that provides access, although some roads may be closed to specific vehicles.

Developed Recreation

Without implementation of the Proposed Action, current use is expected to remain the same with some increase in use anticipated in the future.

Operational activities associated with the Upper Applegate Watershed Restoration Project may cause some short term disruption to developed recreation activities. Some recreations activities may be curtailed to accommodate operations, i.e., temporarily closing adjacent campgrounds or trail heads until the operation activities are complete. This direct effect would degrade the recreation experience for some users who have come to expect a quiet experience with full access to authorized trails and roads. Since not all areas would be receiving treatments at the same time, most trails and roads would remain open while implementation activities occur. The proposed activities would not directly affect developed recreation sites.

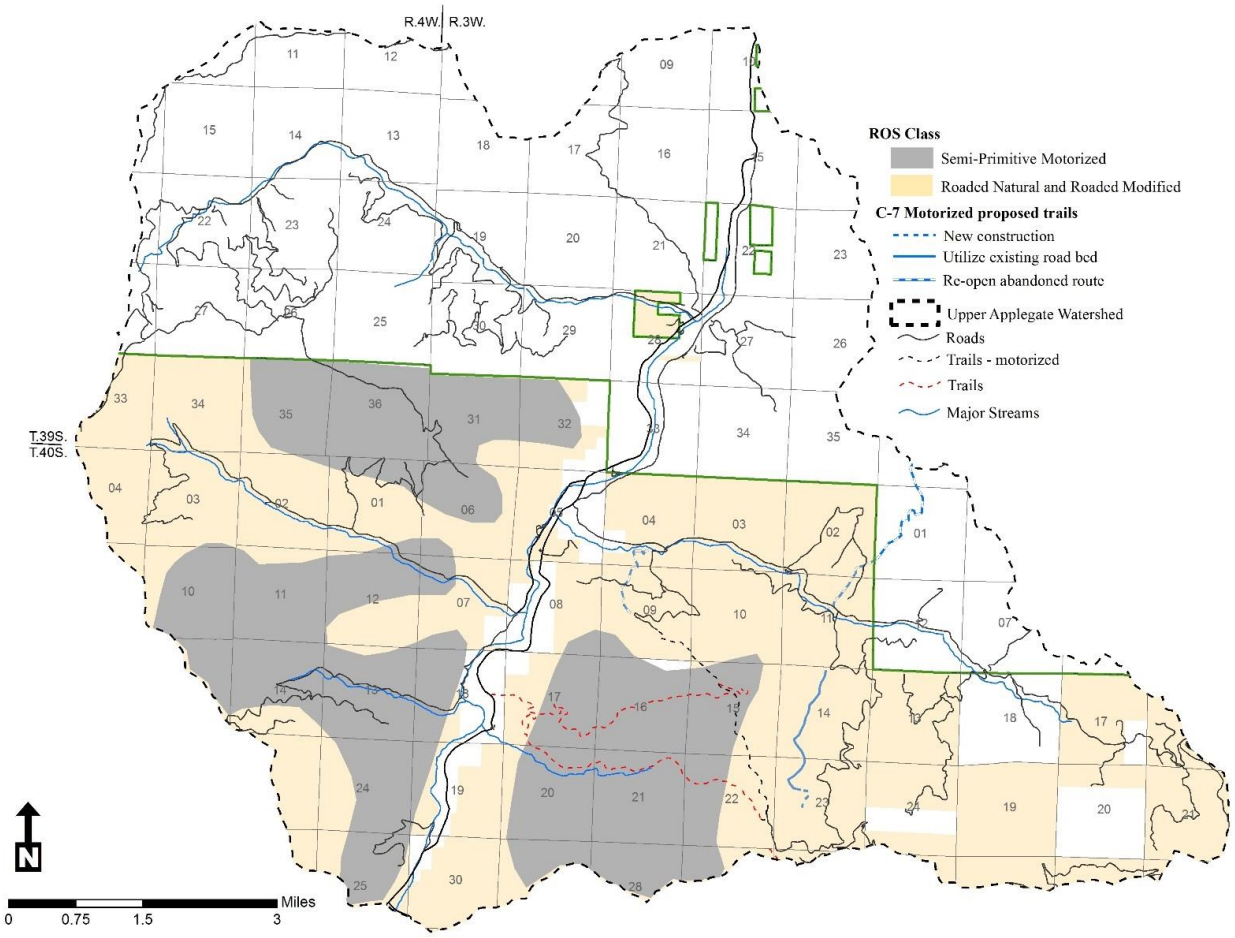
Upper Applegate Road is classified as a paved county highway providing access to over 1,000 residences, Applegate Lake recreational facilities, Beaver Creek road, and numerous Forest Service roadways. Recreational traffic tends to increase during the summer season, primarily on weekends. The developed recreation sites in the Upper Applegate watershed are accessed by these roads that also serve as haul routes for commercial timber removal. A short- term indirect impact to developed recreation sites would be the combining of commercial vehicle traffic and public vehicle traffic which increases the probability of accidents. To mitigate potential accidents between log hauling and public vehicle traffic, contracts or permits would include notifying the public through signing along the roads and possible temporary road closures to public traffic, and not hauling on weekends or holidays.

Another short- term indirect impact to developed recreation sites as a result of this project would be noise from management activities. Refer to the discussion for Sound Disturbance.

Similar to noise, burning piles and under burning could have a short-term impact to developed recreation sites due to smoke impacting the recreational experience. Refer to the discussion for Air Quality.

The project may indirectly affect dispersed recreation sites temporarily, due to personnel using these sites while working on contracts associated with fuel reduction treatments. This effect would be mitigated and managed, and would not result in any long-term adverse effects to the sites.

Figure 5. Recreation Opportunity Spectrum – RRNF LRMP



Trails

Under the 2016 Final Record of Decision for Motorized Vehicle Use on the Rogue River-Siskiyou National Forest, the Charlie Buck/ Baldy Peak trail #918, Mule Creek trail #920 and Mule Mountain trail #919 are open to Class III ATVs (motorcycles). The Mule Creek and Mule Mountain trails are currently not included on the Motor Vehicle Use Map (MVUM) due to the lack of a right of way to access the trails. Currently there are approximately 13 miles of system trails on National Forest lands in the Upper Applegate watershed. Of those, 2.8 miles allow motorized use (motorcycles).

Within the Upper Applegate watershed, there are approximately 83 miles of Forest Service system roads. Of that total, roughly 54 miles allow mixed use, including ATV's.

Under the Proposed Action, an additional 16-18 miles of non-motorized trails (on Forest Service and BLM lands) would be authorized. This would provide additional opportunities for hiking and equestrian use. The trail that would follow the abandoned Palmer Ditch would provide a north to south route connecting to Applegate Lake. The trail that follows Ladybug Gulch would provide access from Star Gulch to Tallowbox Mountain.

Approximately 5½ miles of existing abandoned roads and trails would be incorporated into the motorized trail system which would provide a desirable single track experience for motorized users and provide connectivity to existing motorized routes on BLM lands north of Cinnabar Mountain and Forest Service motorized trails south of Forest Road 20 while minimizing mixed use on paved roads. Trails would be maintained to Trail Class 2- motorcycle standards with an 8"-24" tread width, 6'-7' clearing height, and 4' clearing width.

A key component of trail sustainability is social sustainability, which is how well a trail meets user desires. Each trail user is seeking a specific experience and failure to meet trail users desires can result in overcrowded trails, trails with little use, and/or creation of unauthorized routes. This applies to both motorized and non-motorized trails. Providing highly desirable trail opportunities increases the enjoyment of public lands and the social sustainability of a trail system.

While there is an adequate road system in the Upper Applegate watershed that may be used for ATV's, there is a limited amount of single track trail opportunities. Single track trails with a narrow tread provides users with highly desirable challenges.

Proposed restoration treatment activities identified in the Proposed Action would have a short term direct impact to trail users if trails are to be closed during management activities (mechanical thinning, prescribed fire) due to safety concerns. Log landing sites may be located in proximity to established trails or roads and would preclude trail use during operations.

The primary effect to recreationists in the long-term following project activities would be a slight change in character along roads and trails where restoration activities have taken place. Currently, many of these areas are bordered by dense tree stands and downed woody material that tend to enclose or envelop the trail or road. Under the Proposed Action, these stands would be opened up through cutting and removal of generally small diameter trees along with pruning and underburning resulting in a more open forest. User reaction to this change in character is difficult to predict.

Dispersed Recreation

Impacts as a result of this project to dispersed recreation activities are similar to developed recreation sites except there would be a direct impact to certain dispersed recreation activities during management activities. When management activities are occurring, recreationist would not be able to access some dispersed campsites that are in the Upper Applegate watershed and access to some dispersed campsites would be lost due to the blocking of unauthorized roads near the Placer Day Use site. Other activities such as hunting, and mushroom picking would be disrupted in areas where active operations are occurring.

Impacts to dispersed recreation would be mitigated and/ or reduced by including contract language requiring notification of the public. Additionally signing along roads and possible temporary road closures to public traffic would mitigate impacts. Hauling on weekends or holidays would be restricted to minimize impacts to dispersed recreation activities.

Under the current condition, there would be no restoration treatments, and therefore no mechanism to affect recreation and public safety; current conditions would continue. Public safety risks would potentially increase under major wildfire situations.

The proposed action would not change the long-term developed recreation opportunities described in the Upper Applegate watershed. Recreation and vegetation management activities have co-existed in this area previously, as evidenced by the use of landings and the use of roads constructed for timber removal as trails.

Short-term effects from noise and traffic associated with all harvest operations from the UAWRP would end once the project is completed.

The only long-term impact to dispersed recreation activities would be the loss of vehicle access to the dispersed camping area near the Placer Day Use site. Otherwise, none of the activities associated with the Proposed Action would change the long-term dispersed recreation opportunities.

C. SOUND DISTURBANCE

Noise from proposed restoration-related operations (e.g., ground-based machinery, helicopters, etc.) combined with motorized use related to recreation, may disturb surrounding residents.

In regard to sound, the operational aspects of implementing restoration activities and the identification of roads and trails, for motorized use could affect the public in two main ways. First, physically, sound can have detrimental effects to human hearing, possibly leading to Noise-Induced Hearing Loss (NIHL). Second, sound can become noise and impose an unfavorable effect on recreationists seeking solitude.

Sound is defined as a vibration in the air that can be heard and measured. Noise is defined as a sound that has characteristics that may irritate or annoy a listener, interfere with the listener's activity, or in some other way be distinguished as unwanted (Harrison 1980).

Currently, ambient noise from residential activities, traffic along Upper Applegate Road combined with commercial and forest resource management activities may disturb individuals year round. The severity of the disturbance from these sources is founded on the individual's values and sensitivity to environmental conditions such as noise, and could be considered minor to extremely abrasive to interfere with personal daily activities.

Sounds from motor vehicles can also have detrimental effects on non-motorized recreation users and those seeking solitude, especially on trails. Sound levels or loudness are not good predictors of annoyance because some sounds are considered intrusive even at low levels. In addition, sounds over which people feel they have no control or which are unpredictable, are considered annoying. Sounds such as motorized vehicles, deemed as annoying by many non-motorized users (hikers), distract from the quality of the recreational experience. Conflict frequently arises between those who wish to enjoy and preserve quiet areas, where natural sounds predominate, and those whom wish to use mechanized equipment in such environments (Kariel 1990).

Under the Proposed Action, additional noise from connected actions, (e.g., chainsaws, tractors, yarders, and helicopters operating in the Upper Applegate watershed), would most likely to be heard by nearby residents living along Upper Applegate Road.

By limiting operating periods (depending on type of operations and distance from homes) to 7:00 a.m. to 7:00 p.m. with no operations on holidays and weekends would limit the time and day disturbance would occur. The most prominent noise disturbance would result from the use of helicopters. Topographic features may act to cause "echoing", particularly as helicopters work to lift logs off the forest floor.

Overall, noise from operations could occur seasonally up to 7-10 years, depending on funding and personnel resources and environmental conditions.

Total motorized trail mileage would increase by approximately 5½ miles. This increase would be somewhat offset with the decommissioning of an estimated three to four miles of unauthorized ATV routes. The level of sound from motorized trails use would remain similar as with current use. The main difference would be related to the location of use. The majority of noise would continue to come from traffic on the Upper Applegate Road.

There has been discussions related to lowering the legal noise requirements for off road vehicles from various members and groups within the community. This is being pursued outside of this analysis.

Physical sound from motor vehicle operation across the forest, combined with sounds of hikers, campers, aircraft overflights, logging operations, and various management activities could cumulatively add to the impacts of physical sound and/or noise. The difference in cumulative impacts between the current condition and Proposed Action cannot be quantified, but does not appear to be substantially different. The Proposed Action is not likely to create adverse cumulative noise effects considering this and other current and foreseeable activities.

D. LATE-SUCCESSIONAL HABITAT

Activities associated with restoration treatments and new trail development, along with other connected actions, may affect late-successional habitat characteristics, habitat connectivity, and designated Critical Habitat.

This issue is designed to focus on the effects of restoration treatments on late-successional habitat and how connectivity may affected. The activities proposed under the UAWRP are located within the Oregon Klamath Physiographic Province. All proposed actions would occur within the Upper Applegate watershed (a 5th field watershed) on the Rogue River-Siskiyou National Forest (RR-SNF) and Medford District of the Bureau of Land Management (BLM).

Natural plant community types within the watershed are diverse. In the lower elevations Oregon white oak woodlands and grasslands, chaparral, scattered ponderosa pine, and Douglas-fir occur up to about 3,500 feet in the interior valleys. Above this, the valley is the mixed evergreen zone, dominated with Douglas-fir and madrone up to about 4,500 feet, and a mixed conifer zone on the Cascade side dominated by ponderosa pine, Douglas-fir, incense cedar, and white fir in more mesic sites. California chaparral communities can occupy large patches of the landscape, composed primarily of wedge-leaf ceanothus (*Ceanothus cuneatus*) and manzanita (Arctostaphylos species). Above 4,500 feet is the white fir zone, transitioning into a Shasta red-fir zone up to about 6,500 feet. The project does not propose to treat any vegetation at elevations above 5,000 feet.

Habitat

In the absence of stand-replacement wildland fire or large-scale insect and disease outbreaks, the late-successional habitat within the Upper Applegate watershed would provide suitable migration, travel, and dispersal corridors for multiple species within the Oregon Klamath Physiographic Province. The Upper Applegate watershed would continue to provide high-quality habitat for northern spotted owl, fisher (*Martes pennanti*), and other late-successional species.

Early and mid-seral stands would continue to develop into mature habitat over time. Ecosystem processes such as insect infestations and disease would continue to create decadence, mortality, and deformities in individual or groups of trees which provide diversity in stands and nesting, roosting, and foraging opportunities for many late-successional species.

Large-scale insect or disease outbreaks resulting in tree mortality over large areas could result in substantial loss of late-successional habitat and LSR function and connectivity (refer to the discussion of Insects and Disease).

Large portions of the watershed have missed one or more fire-return intervals resulting in over-stocked stands and high fuel loading. This combined with steep topography, high summer temperatures, and the history of numerous fire starts in the area, creates the potential for large-scale high-severity wildland fire.

This could involve substantial loss of late-successional habitat, and loss of LSR function and connectivity resulting in potential temporary reduction or displacement of some late-successional species.

In the event of large-scale, high-severity wildland fire, the Oregon Klamath Physiographic Province would likely not support current densities of late-successional species. Travel and dispersal corridors from the Siskiyou and Cascade Ranges could potentially be severely disrupted depending on the juxtaposition of late-successional habitat remaining after a fire.

Proposed treatment units include NRF and dispersal habitat for northern spotted owls. The 2011 Revised Recovery Plan for the Northern Spotted Owl provides considerations and treatment guidelines when designing forest restoration projects (USDI Fish and Wildlife Service 2011b).

The primary indicator for effects on late-successional habitat is change of average forest stand conditions that are assumed to currently represent late seral conditions, i.e., stands that average 17 inches or larger in diameter, and have 60% or greater canopy closure.

Conversely, dispersal habitat that occurs in areas of high relative habitat suitability are proposed for treatments that would enhance their development into nesting, roosting, and foraging (NRF) habitat (USDI Fish and Wildlife Service 2011b).

The proposed action would treat and maintain up to 3,912 acres of NRF habitat (37%) (Table 5), the primary treatments are prescribed fire and using fire to maintain previously underburned NRF habitat, up to 3,457 acres of this habitat would be treated by under burning and using fire to reduce ground and ladder fuels and the primary structure and function of NRF would not be affected. These treatments are expected to May Affect, Not likely to adversely affect spotted owl NRF. Up to 661 acres of NRF would be treated with non-commercial thinning (221 acres) in unmanaged stands, thinning in managed stands (33 acres) legacy tree thinning (38 acres). All of these activities would also impact the primary structure and function of NRF would not be affected. These treatments are expected to May Affect, Not likely to adversely affect spotted owl NRF. Some commercial thinning in unmanaged stands (251 acres) would downgrade NRF habitat (120 acres), one percent of the total NRF habitat within the analysis area.

Dispersal-only habitat conditions can be highly variable but in general consist of forested stands with moderate canopy cover that are dominated by smaller, single aged trees with little if any structural features other essential habitat components for nesting or roosting. Effects to dispersal-only habitats are evaluated at a larger landscape scale due to the life history function of dispersal habitat.

The RR-SNF has determined that all proposed treatments would affect 5,849 acres of dispersal habitat (28 percent of the analysis areas dispersal-only habitat) associated with these projects. The nature of the action and the distribution of effects alone is not expected to be substantial overall and would not preclude the ability of NSO to disperse across this landscape.

In summary,

- Canopy cover in treated stands would be maintained at 40 percent; and
- Maintenance activities within dispersal would not remove the components important to owls: trees 11 inch diameter or greater, flying space, and some prey habitat. Any large, remnant standing and down dead wood would be maintained unless they are a danger along roads.
- The amount of basal area maintained would depend on site specific conditions to ensure the stand would still function as dispersal habitat.
- The proposed treatments would be dispersed throughout the Section Seven watersheds to minimize the potential for adversely affecting spotted owl dispersal.
- In addition to the dispersal habitat that would be maintained (or improved in over dense young stands), all NRF would be maintained. NRF provides high quality habitat for dispersing owls.

The proposed action would treat and maintain 1,126 acres of NRF habitat (23%) and up to 1,067 acres of dispersal only habitat(46%) from KLW-4. The proposed action would also treat and maintain 33 acres of NRF habitat (1%) and up to 1314 acres of dispersal only habitat(80%) from KLE-6, almost all of it in plantations or with prescribed fire and fuels maintenance (Table 5).

Table 5. Effects to NSO Critical Habitat from the Proposed Action

	NRF Removed (acres)	NRF Downgrade (acres)	NRF T&M (acres)	Dispersal-Only Removed (acres)	Dispersal-Only T&M (acres)	Total Habitat Acres Treated
KLW-4 (baseline acres)	**4,799**			**2,319**		
All treatments			1,126		1,067	**2,153**
KLE-6	**2,763**			**1,629**		
			333		1,314	**1,647**
% Change to KLW-2 Baseline Habitat	**0**	**0**	**No Change**	**0**	**No Change**	

The effects of all vegetation treatments within the two CHUs for spotted owls is **"May Affect, not likely to Adversely Affect"** designated spotted owl critical habitat.

Connectivity

Recent definitions reflect a broadened understanding of habitat corridors, which are now described as components of the landscape that facilitate the movement of organisms and processes between areas of intact habitat. Implicit in this definition are two ideas: (1) corridors support the movement of both biotic processes (e.g. animal movement, plant propagation, genetic exchange) and abiotic processes (water, energy, materials); and (2) corridors are process- or species-specific (Jongman & Pungetti 2004). To help clarify the terminology on corridors that support biotic processes, Jongman and Pungetti (2004) distinguish between three different types:

- Migration corridors are used by wildlife for annual migratory movements between source areas (e.g. winter and summer habitat). An example of a migration corridor is the Path of the Pronghorn in Wyoming.

- Dispersal corridors are used for one-way movements of individuals or populations from one resource area to another. Dispersal is critical to the maintenance of genetic diversity within populations of species and to the persistence of fragmented populations which may require regular immigration to avoid local extinction.
- Commuting corridors link resource elements of species' home ranges to support daily movements including breeding, resting and foraging. As such, commuting corridors facilitate localized movements throughout the landscape important to daily survival and reproduction.

Although the term 'linkage' is frequently used synonymously with corridor, 'linkage' technically refers to broader regions of connectivity important to facilitate the movement of multiple species and maintain ecological processes. For the UAWRP, three species are used to analyze connectivity, both within the watershed and linkages to other watershed and landscapes outside the Upper Applegate watershed. Three species that are associated with canopy cover and structure are used here to discuss connectivity; the northern spotted owl, fisher, and the Siskiyou Mountain salamander. All require certain habitat characteristic to facilitate connectivity though owls and fisher are more mobile, while for the Siskiyou Mountain salamander, little is known or to what degree connectivity is needed for this species.

The **northern spotted owl** is considered to need at least a minimum of 50 percent on the landscape in a condition sufficient to facilitate dispersal between and within populations. It is referred to as the '50-11-40' rule.

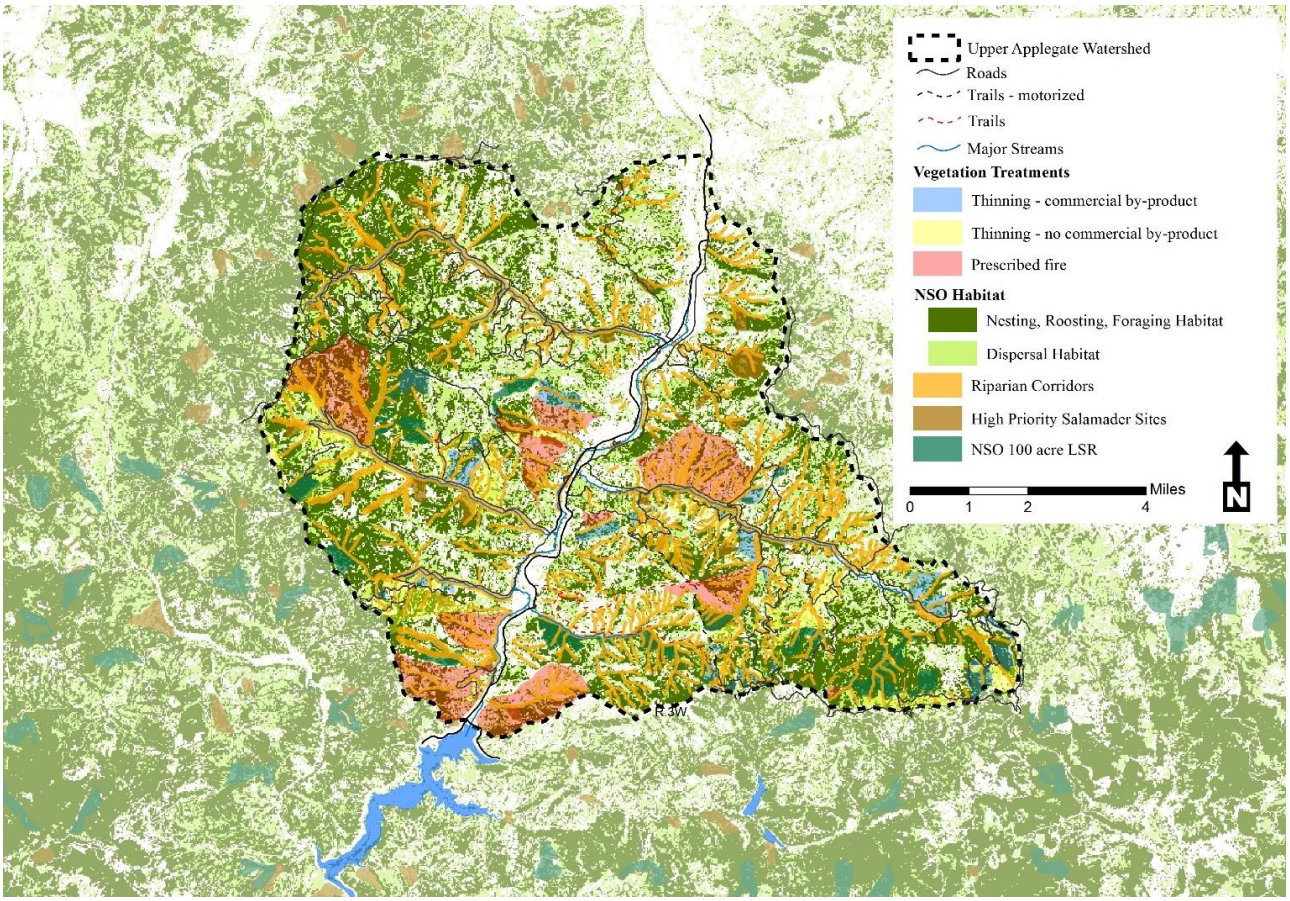
In general, the landscape should have at least 50 percent of its conifer dominated landscape with a minimum of canopy cover of at least 40 percent canopy cover with a minimum of 11 inch DBH (diameter at breast height) trees. Currently, within the Upper Applegate watershed, 68 percent of the area provides dispersal habitat in the form of dispersal-only and NRF habitat. However, there are also other non-conifer dominated stands of oak and pine that can act as dispersal habitat and may also facilitate dispersal by northern spotted owls. No treatments or proposed activities in the Proposed Action would reduce dispersal habitat. Therefore, the Proposed Action would not affect spotted owl dispersal across the planning or larger landscape.

The **fisher** is considered to use a wide variety of habitats for foraging and dispersal (Clayton Personal Obs.). Currently within the UAWRP, 68 percent of the area is provides dispersal habitat for northern spotted owls in the form of dispersal-only and NRF habitat. Fisher can easily use this habitat to disperse through and across the landscape. In addition, there are also other non-conifer dominated stands of chaparral, oak and pine habitats that are used as forage habitat by fisher and that may also facilitate dispersal by fisher (Clayton Personal Obs.). No treatments or proposed activities would reduce any dispersal habitat. However there would be up to 120 acres of NRF habitat within the Proposed Action that may be reduced to below 60 percent canopy cover. Fisher may avoid for this area for some time until the canopy cover returns. However in a recent study in the Ashland watershed (Tessa Smith Utah State, in review), canopy cover was not a significant variable in habitat use or den sites. This could be due to the general lack of treatments in the study area that reduced canopy cover to below 60 percent. Otherwise fisher used all types of habitats for denning and foraging including those that has been treated both commercially and non-commercially. Units in UAWRP are widely spaced across the watershed and would not likely provide a barrier to fisher dispersal. The Proposed Action should not affect fisher dispersal across the planning or larger landscape.

Little is known about the dispersal needs or ecology of the **Siskiyou Mountain salamander**. Populations are typically scattered rather as disjunct populations across the landscape as are their habitats: deep rocky soils with high amounts of canopy cover. Plethodontid salamanders are known to have very small home ranges (<2 meters) and occur in high abundance in suitable habitats. It is unknown if they will disperse to other populations. Genetic analysis of this species in the Applegate show that these populations are almost identical at the cellular level and likely a result of a founder effects sometime during the Pleistocene era (Clayton Pers comm), then possibly a subsequent retraction of their range into these small disjunct populations.

However, habitat modelling show that their habitats are widespread in the area of the Proposed Action and there is the possibility that they can and do disperse from sub-population to sub-population. All activities under the Proposed Action will follow the conservation strategy for this species and should not result in direct effects to population or the potential for dispersal form population to population.

Figure 6. Connectivity for the Upper Applegate Watershed



E. INVENTORIED ROADLESS AREAS

Activities associated with restoration treatments and new trail development, along with other connected actions, may affect the character of Inventoried Roadless Areas (IRA), other areas with roadless character (some people may value these areas for their undisturbed or spiritual character), or lands with wilderness characteristics (LWC).

Controversy over roadless areas has been in public debate for decades. Areas without roads often provide outstanding dispersed recreation opportunities, such as hiking, camping, picnicking, wildlife viewing, hunting, fishing and botanizing. While they may have many wilderness-like attributes, unlike Wilderness areas, the use of mechanized and motorized travel is often allowed. These areas can also take pressure off heavily used wilderness areas by providing additional solitude, quiet, and dispersed recreation opportunities.

Within the Upper Applegate Watershed there are two Inventoried Roadless Areas (IRA's) on National Forest Lands and a District Designated Reserve on BLM lands (identified as Lands with Wilderness Characteristics - LWC). Forest Service policy (Forest Service Handbook 1909.12) requires the agency to address potential wilderness areas (PWA) on National Forest lands.

Additionally, there are other areas within the Upper Applegate watershed that do not have roads and have characteristics similar to inventoried roadless areas. There is an opportunity and obligation under NEPA to respond to these public identified areas received during scoping for this project. For this analysis, they are referred to as semi-primitive unroaded areas.

Inventoried Roadless Areas (IRA's)

Inventoried Roadless areas, like Wilderness, are valued by many for their very existence in an undeveloped state. This value is experienced practically by users of the area, and intrinsically by those who place value in simply knowing that undeveloped lands, perceived as "wild," still exist.

The Kinney and Little Grayback Inventoried Roadless Areas are located entirely on lands administered by the Rogue River–Siskiyou National Forest. Neither Inventoried Roadless Area is adjacent to, contiguous to, or near any designated Wilderness area.

The Kinney Creek IRA is in total, approximately 7,790 acres in size of which 4,570 acres fall within the Upper Applegate watershed. This IRA lies on the west side of the Applegate River and includes portions of the Palmer and Kinney Creek drainages. The area outside of the Upper Applegate watershed borders the southwest side of the Upper Applegate watershed. The Little Grayback Inventoried Roadless Areas is located east of the Applegate River and includes approximately 7,500 acres with 4,150 acres within the Upper Applegate watershed. The remaining area borders the southern edge of the watershed.

Without implementation of the Proposed Action, there would be no change to the current conditions within the IRA's. Current uses would be continued. Risk to disturbances from fire and insect and disease would remain the same (refer to discussion on Attainment of Purpose and Need).

Although approximately 5,410 acres are proposed for some form restoration treatment under the Proposed Action within the Kinney and Little Grayback IRA's, this is an upper threshold of extent used for analysis purposes. The proposed treatments in the IRA's include prescribed fire and some thinning (with no restoration by-product) along some strategic areas. No commercial removal of material would occur in the IRA's.

Prescribed fire would be the primary tool used in the IRA's, An estimated 230 acres would be thinned with the treatments focused on surface and ladder fuel reduction along the ridge on the south side of the Kinney Creek drainage.

Under the Proposed Action, there would be no effect to roadless character resultant of new roads or landings as none would be constructed within the Inventoried Roadless Areas.

Proposed management actions such as density management and prescribed fire would not alter the natural appearance or visual variety from a landscape perspective, but would be evident from a foreground perspective. During operations, opportunities for solitude and primitive recreation would be diminished due to increased noise and presence of equipment and forest workers.

The proposed management actions may affect the existing character for those who feel it should remain undeveloped as to eliminate all evidence of human disturbance. Logging and mechanical brush treatments would affect the undisturbed appearance, most evident alongside existing trails and bordering roadways.

The Proposed Action is not predicted to affect outstanding attractions, vista points, scenic backdrops or overall roadless natural appearing landscape characteristics. Therefore, the proposed action is not predicted to directly affect the potential for either Kinney or Little Grayback Inventoried Roadless Area from future Wilderness designation. The Proposed Action would reduce fire hazards to increase the probability of protecting roadless features and integrity in the event of a future wildfire.

Cumulative effects associated with the Proposed Action would not adversely affect the character and potential of Kinney or Little Grayback Inventoried Roadless Areas for future Wilderness designation. The implementation of fuels reduction activities would affect short-term characteristics as stated under the direct effects.

Lands with Wilderness Characteristics (LWC)

Lands with wilderness characteristics retain a primeval character, without permanent improvements and generally appear to have been affected primarily by the forces of nature. These lands provide a variety of resource benefits, including wildlife habitat, clean water, and primitive recreation opportunities.

The BLM's Resource Management Plan includes prescriptive management direction to meet the Management Objective to protect wilderness characteristics (i.e. roadlesseness, naturalness, opportunities for solitude and primitive unconfined recreation, and identified supplemental values), while allowing competing resource demands that do not conflict with preserving long-term wilderness characteristics.

The RMP allows trail construction and maintenance, fuels treatments, invasive species management, riparian or wildlife habitat improvements, forest management, and other vegetation management only if any reductions in wilderness characteristics are temporary and wilderness characteristics are protected over the long term.

This area is referred to as the Burton-Ninemile LWC.

The Burton-Ninemile LWC totals approximately 5,933 acres of which 3,654 acres fall within the Upper Applegate watershed. Areas outside of the watershed lie to the north and west.

The Proposed Action is not predicted to affect outstanding attractions, vista points, scenic backdrops or overall roadless natural appearing landscape characteristics. The only treatments proposed are fuels maintenance (985 acres). The Proposed Action would reduce fire hazards to increase the probability of protecting roadless features and integrity in the event of a future wildfire.

Unroaded Areas

The Upper Applegate Watershed contains several areas that possess some unroaded character and values not included as IRA's or LWC. This sub-section documents the criteria used to identify unroaded areas for this analysis. This process does attempt to reflect the concerns and values expressed during scoping. Furthermore, it is not meant to satisfy any one particular set of values as received from any one person or organization.

For the Upper Applegate Watershed, the criteria used to identify unroaded areas includes:

Size: The criteria for size of area incorporates similar parameters as the national roadless policy, namely: 1,000 acres or larger for any one individual area, non-contiguous to any other area; or any reasonable size when contiguous to existing IRA's. "Reasonable" is further defined as having habitat value and character; a criterion of 500 feet was used to define any area in width at its narrowest point.

Roads and distance from roads: Each area shall not include any managed or unmanaged, "classified" or "system" road currently on the Forest Service or BLM transportation system. A "road" is defined as a motor vehicle travelway over 50 inches wide and includes Forest Service and BLM roads, State roads, County roads, private roads, and other permitted roads.

Vegetation condition: Based on average natural stand conditions, stands should be at or near to late seral stage or late-successional habitat conditions for the sub-watershed (i.e., for a given site). For the Upper Applegate Watershed, this has been determined to be stands ages of approximately 120 – 140 years or more. Vegetative areas can also include contiguous natural, non-forested or sparse vegetation types and plant communities, e.g., meadows.

Degree of past management: Areas should be relatively un-entered and un-managed; minimal past salvage activity would be acceptable. Areas would not include any areas that were managed as regeneration is the last 100 years (e.g., clear-cut or shelterwood silvicultural treatments).

As shown on Figure 7, there are four areas identified that meet the mapping criteria described above. Because they are for analysis purposes only, they are labeled A, B, C, and D.

Direct effects include restoration treatments (density management, surface and ladder fuel treatments, prescribed burning, etc.), occurring in areas identified through GIS analysis utilizing the above described process. Figure 7 portrays the unroaded areas based on the criteria described above. The following discussion includes the extent or area of effect (change) to these areas.

Table 6. Effects to Other Unroaded Areas

Unroaded Area	Total Acres	Acres Treated Proposed Action	Percent of Total Area Treated	Acres of Density Management	Acres of Prescribed Fire
A	1,850	896	48%	71	825
B	342[1]	3	1%	1	2
C	1,070	247	23%	140	107
D	3,010	1,585	53%	15	1,570

[1] Although less than 1,000 acres, this area is adjacent to the Little Grayback IRA.

Although no new roads or landings would be constructed, management actions such as density management and prescribed fire are proposed. These actions would not be overly evident from a landscape or overhead view but would be visible to persons walking through areas where treatments occurred.

The proposed management actions may affect the existing character for those who feel it should remain undeveloped and show no evidence of human disturbance. There would be no change to late-successional habitat or late seral vegetation conditions. Some stumps and evidence of management may be evident.

The ecological effects of fragmentation and late-successional forest connectivity would be minimal with these types of treatments and the resulting reduction in fire hazard and risk and increase in resilience may further protect the integrity of these unroaded areas.

The only activities that would cumulatively occur on the same acre are restoration reduction treatments, e.g., density management, activity fuels treatments and/or maintenance prescribed burning.

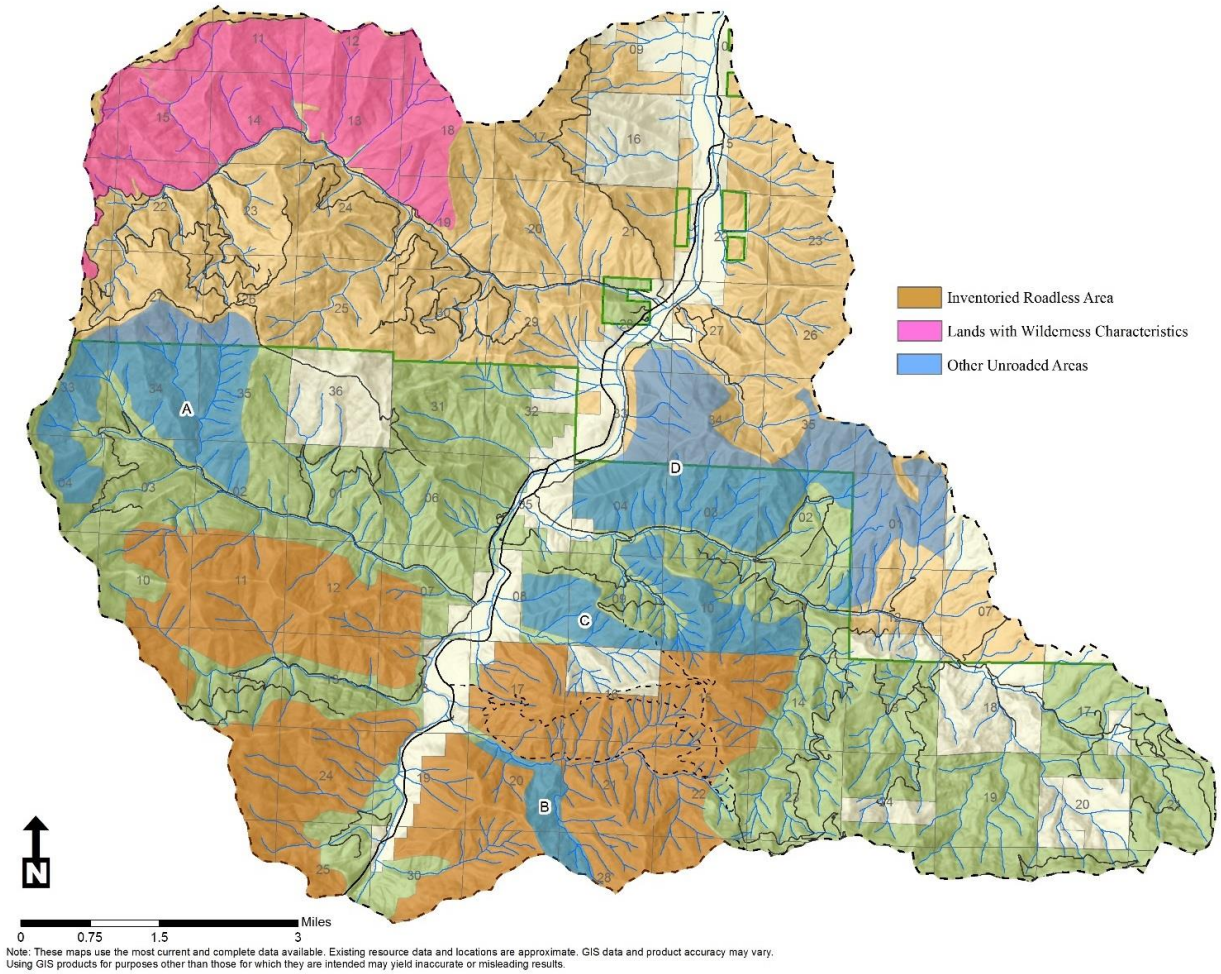
As with the IRA, ecosystem function is not a product of specifically designated boundaries. Specific ecological effects of fragmentation and late-successional forest connectivity are discussed in more detail in the Late-Successional Habitat issue.

Potential Wilderness Areas (PWA)

Potential wilderness areas do not reflect a land designation decision, do not imply or impart any particular level of management direction or protection, are not an evaluation of potential wilderness, and are not preliminary administrative recommendations for wilderness designation. The inventory of PWAs does not change the administrative boundary of any IRA or any congressionally designated Wilderness areas.

PWA inventories typically occur during a forest plan revision. When the Rogue River-Siskiyou National forest conducts forest plan revision, an inventory of PWA would be conducted at that time. Currently, there are no known identified PWAs within the Upper Applegate watershed.

Figure 7. Inventoried Roadless Areas, Lands with Wilderness Characteristics, and Other



F. SEDIMENT DELIVERY

Activities associated with restoration treatments and new trail development, along with other connected actions, may affect water quality via erosion and resultant sediment delivery to streams.

Sediment delivery is the indirect result of the amount of sheet erosion and ravel moving into unstable zones, the percent of effective ground cover, the number and size of landslides, root strength, and slope features. The actual amount of sediment delivered to a stream channel is related to all of these features and is dependent the magnitude and timing of climatic events, which is the driving force. Standards which govern the proposed operations can control the amount of ground disturbance relative to the physical features, but cannot control the weather. The Rogue River National Forest LRMP Standards and Guidelines for the amount and location of ground disturbance are believed to be sufficient to control sediment delivery at a level that is below levels that would produce adverse resource damage.

Fire can adversely affect the physical and biological composition of soil. Soil burn severity is a qualitative term that describes classes of fire-caused changes to soil hydrologic function. The classes are identified by soil characteristics and surface fuel and duff consumption following fire and incorporate residence time. The resultant classes are Unburned to Very Low soil burn severity, Low soil burn severity, Moderate soil burn severity, and High soil burn severity.

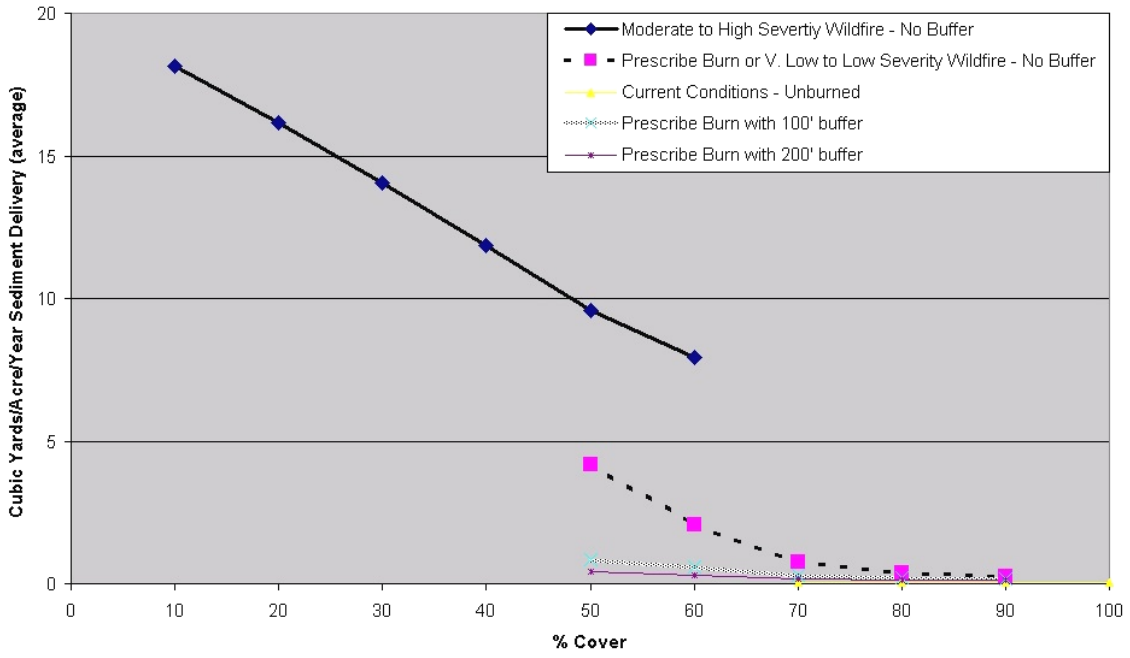
In general terms, the higher the temperatures and the longer the residence time associated with the fire, the greater the effects. With increasing soil burn severities, soil erosion and resultant sedimentation would increase. Without vegetation and intact duff layers to moderate conditions, runoff rates would increase. The presence of water repellent soils would further increase runoff rates, which would facilitate increased erosion and sedimentation.

Once sediment is delivered to stream channels, it would become entrained in the system and move down-channel in relation to stream flows. Sediment will hardly move at all during low flows and will move in great quantities during high flow or flood events. The stream channels have a complex morphology. Generally, the channels have steeper gradients toward the upper ends of the drainages. The gradient becomes progressively gentler the lower one goes in the drainage. The effects of channel morphology on sediment movement have been described by Montgomery and Buffington (1993) in the general terms of source, transport, and response.

With the current fuel loading conditions, a wildland fire would likely leave a large portion of the area in the moderate and high soil burn severity categories. When wildland fires burn, there is no control over burn severity. The Quartz Fire, which burned over 6,000 acres immediately northeast of the Upper Applegate watershed, had 41% of the burned area in the severe soil burn severity, and 35% in the moderate soil burn severity categories.

The greatest increase in sediment from surface erosion sources would occur during the first and second years after large-scale wildland fire. As soil cover increases through plant re-establishment, needle and leaf cast from standing dead or live trees, and armoring of the soil surface, erosion and sediment rates should decline. Figure 8 shows the relationship of soil cover to sedimentation and why it is important to maintain soil cover near stream channels.

Figure 8. Predicted Erosion Rates Using WEPP



The activities proposed in the Proposed Action are designed to reduce fire hazards by managing the density of vegetation and surface fuels in selected areas. Each of the proposed treatment methods, whether prescribed fire or density management, would be appropriate for the land and conditions where applied. With each project type, land managers would have control over the exact area where the treatment would be applied, and the conditions under which the application would occur. For instance, in the case of prescribed fire, activities can happen at a time when fuel moisture is high. The prescribed burn areas would have fire lines surrounding them, and crews on-site to manage the fire. The resultant burn severity would be mostly in the low category.

All trails proposed under the Proposed Action are designed to reuse existing upland roadbeds, mining ditches, or previously abandoned trail routes, except where two short re-routes are needed on the Charlie Buck motorized trail proposal. Based on project design criteria and mitigation measures regarding sustainable trail design and erosion control features, and the known effectiveness of adjacent organic matter in capturing and preventing off trail movement of trail tread erosion, it is expected there would be little surface soil erosion, which would be localized to the trail tread.

Mitigation measures prescribed in the form of Best Management Practices are designed to protect water quality. Buffers of intact vegetation and duff layers would separate the treatment areas from stream courses. These areas would trap eroded soil before it moved down slope into a stream channel. The resultant sediment yield would be much less than the yield following a wildland fire and would be just slightly more than under the current condition. There should be no measurable change in sediment yields in the streams as a result of surface erosion following implementation of activities associated with the Proposed Action.

An indirect effect of a large high severity wildland fire would be an increase in water yield. This would be a result of lower infiltration rates on the burned-over land, from decreased interception of precipitation on leaves and needles of vegetation, and from less transpiration. The increased runoff would partially be realized as increased summer flows. It is doubtful that this benefit would offset the other adverse effects and costs of having a large area of the Upper Applegate watershed damaged by fire.

The activities under the Proposed Action would have no, or minor adverse effects on sedimentation affecting water quality in watershed streams. Controls on location and timing of activities, slope, size of riparian buffers, amount of disturbance, prescribed burn intensities, etc. would mitigate the amount of erosion and sediment attributable to the project. The minor change in erosion and sedimentation would not accumulate with effects from other activities to the point where cumulatively, there would be an adverse effect.

G. OLD AND LARGE TREES

Activities associated with restoration treatments and new trail development, along with other connected actions, may affect late seral or old-growth vegetative conditions and old or large trees. This may cause a change in amenity values for recreation use and/or existence values for those who believe such conditions should be preserved on public lands.

Whether or not to cut and/or remove old and large trees is one of the more important issues that is debated for projects that are designed restore resilient stand conditions and to reduce hazardous fuels. Some people want policies that prohibit any removal of trees over a specified diameter. Scientists however, point out that such a blanket policy could have substantial consequences on attainment of the desired functions of stands.

For the UAWRP, the Northwest Forest Plan (NWFP) provides direction on Forest Service lands to maintain, or contribute toward the restoration of, the structure and composition of old-growth stands. For this analysis, old-growth is defined as late-successional habitat, as described by the NWFP.

For this project, vegetation treatments focus largely on thinning small-diameter trees and prescribed fire and would maximize the retention of large trees, as appropriate for the forest type, to the extent that the large trees promote resilient stands. Treatments prescribe the retention of large, fire-resilient trees (generally sun tolerant tree species adapted to fire processes) to the degree this practice is feasible and allows for safe operations.

Large trees of selected species that are not adapted to fire processes may need to be removed to promote greater stand resiliency. Similarly, the removal of small- to mid-sized trees would generally be needed to reduce competition within the treatment area, providing for more resilient stand conditions and curtailing uncharacteristically severe wildland fire effects and enabling use of prescribed fire.

Treatments that directly affect old-growth are discussed under the late-successional habitat Relevant Issue. Amenity values associated with old-growth forest are tied to the discussion on Inventoried Roadless Area and unroaded character.

The discussion of effects for this issue (large trees) is focused on the quantities of large trees by size class. A "large" tree is somewhat a value judgment and difficult to define.

For this analysis, two size classes are used to identify large trees. These classes are 17 to 21 inches in diameter, and greater than 21 inches in diameter. Estimates for the number of trees cut per acre by size class are based on modeling satellite imagery and from experience with similar projects. These estimates are intended to provide a rough indication of quantity for comparison purposes.

The exact quantity of large trees to be cut under the Proposed Action would ultimately be determined by field verification of the treatment criteria and tracked during implementation monitoring. Refer to the Project Design Criteria in Chapter 2 of the EA related to large trees.

If the Proposed Action is not implemented, there would be no restoration treatments, therefore no large trees or old-growth forest would be cut. If no large-scale high-severity fire were to occur within the Upper Applegate watershed, the numbers of large trees would slowly increase to some point where mortality related to over-density would occur. In the event of a wildland fire, there is the potential to lose portions of the large tree component due to a high-severity fire. The actual extent of this loss is unknown and is not able to be accurately predicted.

As a result of not cutting any large trees, there would be no indirect adverse effect from restoration treatments. The indirect effects on large trees from continued density and from potential large-scale high-severity wildland fire is discussed in other Relevant Issues. If large trees were not cut, the ecological sustainability value (protection of legacy trees) would not be obtained.

Variable density management under the Proposed Action would include "thinning from below" so the mean diameter of the residual stand after treatment would likely be greater than the current mean tree diameter for the stand prior to treatment. As large trees with thick bark are more resilient to fire than smaller trees with thin bark, prescribed fire treatments would maintain the retention of larger tree classes.

As less than one percent of the previously managed stands proposed for treatment contain large trees greater than 21 inches in diameter, variable density management under the Proposed Action would retain all such trees. Some trees between 17 to 21 inches in diameter could be removed. However, removal would only occur in cases where such trees are infected, infested or would die within 1 year and are growing in a cluster of surrounding healthy large trees. In this instance, if the tree in this diameter class is determined to create a risk to the survival of surrounding larger trees, would it be felled and removed. It is predicted 0.02 percent of trees in this size class would be removed, resulting in a minor effect.

The following table displays an estimate of the number of large trees that would need to cut to achieve the resilience objectives. A range is shown because an exact number is difficult to estimate. As mentioned previously, these estimates are based on monitoring of projects with similar objectives and by modeling satellite imagery and are intended to provide a rough extent for comparison purposes. Once density targets, snag recruitment, down wood, and soil management objectives are satisfied, felled trees are considered excess to restoration objectives, and are available for removal.

Table 7. Estimate of Large Trees per Acre to be Cut – Proposed Action

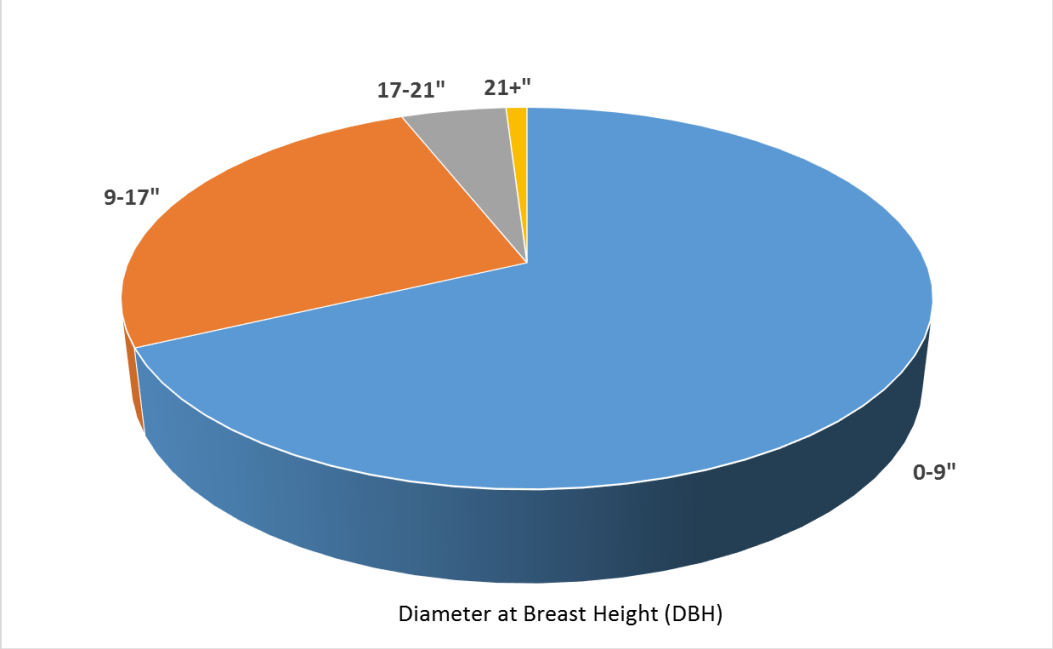
Component	Estimated Trees per Acre to be Cut or Fire Killed	
	17-21" DBH	> 21" DBH
Legacy Tree thinning	3-5	0-2
Natural Stand thinning	2-4	0-2
Previously managed stand thinning	0-2	0-1
Prescribed burning	0-1	0-1
Landings	2-4	0-2

Density management treatments (legacy tree thinning, natural stand thinning, and previously managed stand thinning) would occur on approximately 1,520 acres, where large trees could be cut. Prescribed burning is proposed as an initial entry on approximately 4,910 acres. All of the treatments areas would be followed by maintenance burning. This would occur generally 3 to 8 years following completion of the initial treatment and then on a regular interval mimicking the natural fire return interval.

Under the Proposed Action, the cutting of large trees would directly and indirectly lead toward meeting the restoration objectives. Large trees often provide the greatest competition to conservation of legacy trees, however if some larger trees were not cut, the ecological sustainability value (protection of legacy trees) would not be obtained. The amenity values of late-successional or old-growth forest would be changed to some degree as discussed in other Relevant Issues.

There would be no cumulative effects because the only activities that would cumulatively occur on the same acre are restoration treatments, e.g., density management, activity fuels treatments and/or maintenance prescribed burning.

Figure 9. Estimated Distribution of Cut Trees by Size Class – Proposed Action



Cumulatively, the Proposed Action would add to the loss of large trees, estimated to be less than 1 percent of the total of large trees, some of which have previously either been removed through human management of timber, road or trail construction or have died as a result of insect, disease, drought or maturation.

Inversely, in the long-term, the potential for large tree development would be increased as tree growth would be accelerated with the reduction in environmental stress. Lower stand densities would make available more nutrients, light, and water to support individuals, particularly the initial ~5 years after implementation.

H. SOIL AND SITE PRODUCTIVITY

Activities associated with restoration treatments and new trail development, along with other connected actions, may alter soil characteristics through combustion, compaction, erosion, and structural modification and/or removal of coarse organic matter.

Soil Characteristics

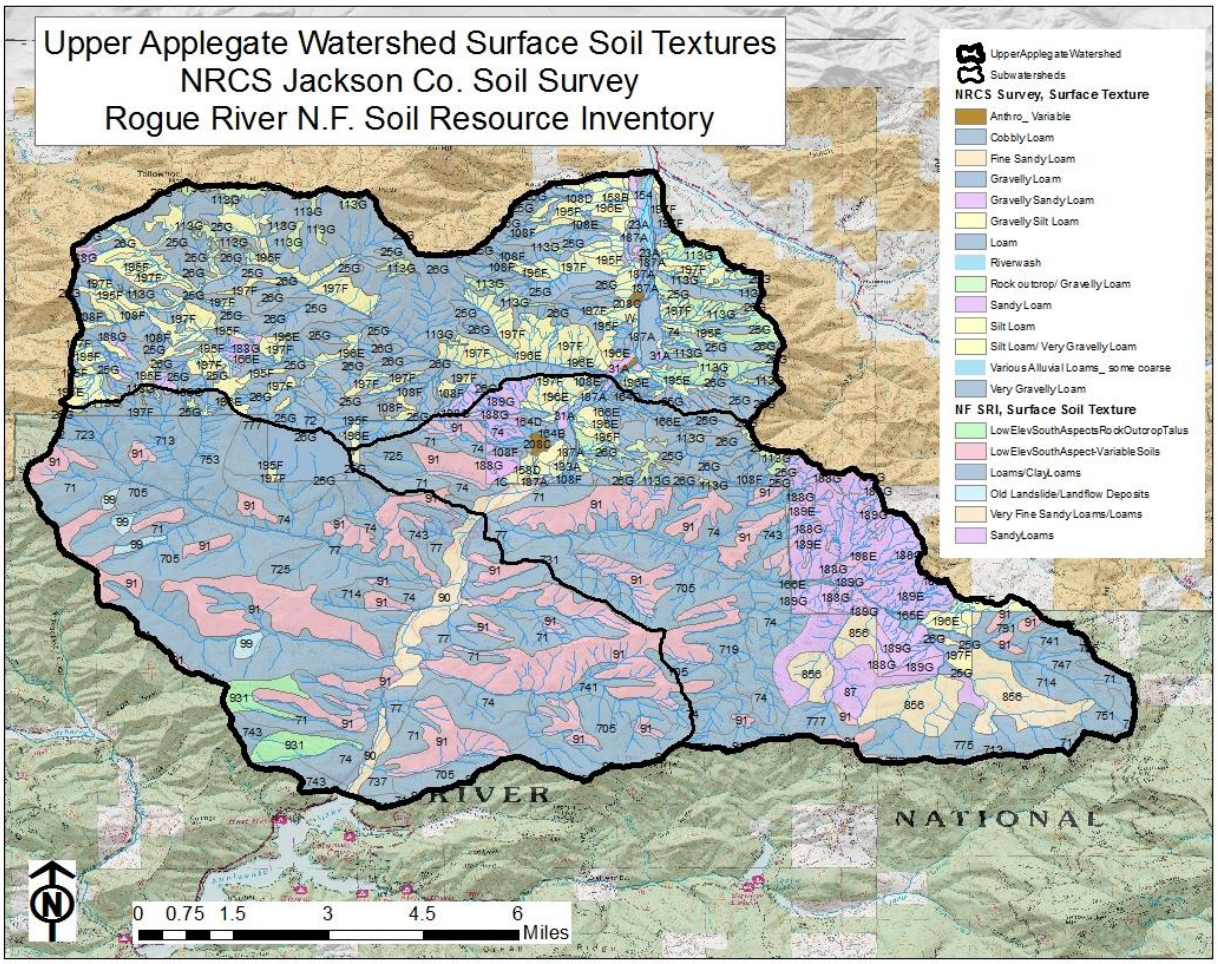
Soil is the unconsolidated, variable-thickness layer of mineral and organic matter, formed as a result of physical, chemical, and biological processes functioning simultaneously on geologic parent material over long periods (Jenny 1941, Singer and Munns 1996).

Soil is formed where there is continual interaction between the soil system and the biotic (faunal and floral), climatic (atmospheric and hydrologic), and topographic components of the environment. Soil interrelates with other ecosystem resources, namely, it receives and processes rainfall and supplies air, water, nutrients, and mechanical support for the sustenance of plants.

Soils have been identified and mapped as part of the Rogue River National Forest Soil Resource Inventory (Badura and Jahn 1977) on National Forest System lands, and by the Natural Resources Conservation Service as part of the Soil Survey of Jackson County (NRCS 1993) on Bureau of Land Management lands.

The soils in the Upper Applegate watershed have been weathering from highly deformed and metamorphosed volcanic and sedimentary rocks of the Applegate Group, Klamath Geologic Province (DOGAMI Geologic Compilation V5). These soils tend to be loams and silt loams, and typically have a high gravel or cobble content. South facing aspects in particular tend to have slopes with particularly shallow soils and exposed rock outcrop. Several areas of younger, granitic intrusions have been exposed during mountain uplift, providing coarser textured and less cohesive sandy soils, particularly in the upper end of the Beaver Creek sub-watershed, as well as an area to the west of the Applegate River between Star Gulch and Palmer Creek.

Figure 10. Upper Applegate Soils Map



Combustion

Severity can be used to describe the effects of fire on the soils (Simard 1991), as it integrates both the heat pulse above ground and the heat pulse transferred downward into the soil. It reflects the amount of energy (heat) that is released by a fire during the combustion of fuels, transferred downward to the litter surface (Rowe 1983, VanWagner 1983, Ryan 2002).

The magnitude of change occurring during a fire depends largely upon the level of fire severity, combustion and heat transfer, magnitude and depth of soil heating, proximity of the soil property to the soil surface, and the threshold temperatures at which the different soil properties change. For instance, where the surface litter is blackened (charred), but not consumed indicates minimal heat has been transferred downward.

Conversely, if the fire also consumes substantial surface and ground fuels, the residence time on a site is greater, and more energy is transmitted into the soil. In such cases, a "white ash" layer is often the only post-fire material left on the soil surface (Wells and others 1979, Ryan and Noste 1985). Because the rate at which energy can be transmitted through the soil is limited by the soil's thermal properties, the duration of burning is critically important to the effects on soils (Frandsen and Ryan 1986, Campbell and others 1995).

Energy generated as heat during the combustion[2] of above-ground and surface fuels provides the driving force that causes a wide range of changes in soil properties during a fire (DeBano and others 1998). During the combustion process heat and a mixture of gaseous and particulate byproducts are released. Flames are the most visual characteristic of the combustion process.

Compaction and Puddling

Compaction is an increase in bulk density and a decrease in soil porosity resulting from applied loads, vibration, or pressure. Soil compaction increases bulk density by compressing soil particles together, reducing the volume of unoccupied air spaces. Macro porosity is reduced while micro porosity increases as large pores are crushed into smaller ones. An increase in micro porosity can lead to greater available water-holding capacity throughout the site, but at the expense of aeration and drainage (Neary et al. 2005). Puddling is a severe form of compaction, which results in soil deformation and loss of soil structure, often to the point of losing the ability of the soil to infiltrate water effectively and being inhospitable to plant roots.

Erosion

Erosion is the dislodging, transportation and deposition of soil and rock from the landscape in response to water, wind or ice. These forces are related to the climate of the region. Running water is the chief cause of surface erosion in the forms of sheet, rill, gully, and channel erosion.

There is a high potential for surface erosion when soils are disturbed through loss of soil cover, compaction, removal of soil or loss of site organic matter. The potential for sheet erosion increases with the reduction in effective soil cover. The greatest potential for erosion is during the first year after disturbance. Erosion potential decreases rapidly after the first year with the re-establishment of vegetation, the input of plant litter and needle cast.

Soils mapped within the Rogue River National Forest Soil Resource Inventory, as well as those mapped by the Natural Resources Conservation Service, are given soil erosion potential ratings, also called soil erosion hazard ratings, which is based on the expected losses of surface soil if all vegetation cover and litter is removed through some form of disturbance. Site characteristics such as slope gradient, soil texture, and parent material are considered in the ratings. Within the Upper Applegate watershed, the majority of soils have a severe erosion potential rating, with granitic soils rating very severe, and gentler toe slopes and valley bottoms having moderate to very low erosion ratings, respectively.

[2] **Combustion** is the rapid physical-chemical destruction of organic matter that releases the large amounts of energy stored in fuels as heat. These fuels consist of dead and live standing biomass, fallen logs, surface litter (including bark, leaves, stems, and twigs), humus, and sometimes roots.

Organic Matter

Organic compounds are found in both above-ground and below-ground biomass where they make up the standing dead and live plants and dead organic debris (that is, leaves, stems, twigs, and logs) that accumulate on the soil surface and throughout the soil profile. The amount of aboveground and belowground organic matter varies widely between different vegetation types depending upon the temperature and moisture conditions prevailing in a particular area (DeBano and others 1998).

Many chemical properties and processes occurring in soils depend upon the presence of organic matter. Not only does it play a key role in the chemistry of the soil, but it also affects the physical properties and the biological properties of soils as well. Soil organic matter is particularly important for nutrient supply, cation exchange capacity, and water retention, as well as providing cover to protect soils from erosion.

Under the Proposed Action, activities that can have an effect on the soil resource include: road restoration, unauthorized OHV trail decommissioning, use of heavy equipment for vegetation treatments, slash pile burning (hand piles or machine piles), prescribed fire, and non-motorized and motorized single-track trail construction and use. Some of these are beneficial effects, and some have the potential to result in short-term and/or long-term negative effects. The spatial extent of the negative effect determines if it would cover a large enough continuous area to be considered a detrimental soil effect. Project design criteria and mitigation measures planned for this project are designed to minimize negative effects to the soil resource to meet Rogue River National Forest Plan standards and guidelines.

Combustion

Proposed activities that can effect soils through combustion include prescribed fire treatments, and hand pile or machine pile slash burning.

Heat produced during the combustion of aboveground fuels (for example, dead and live vegetation, litter, duff) is transferred to the soil surface and downward through the soil by several heat transfer processes (radiation, convection, conduction, vaporization, and condensation). As heat is transferred downward into and through the soil, it raises the temperature of the soil. The greatest increase in temperature occurs at, or near, the soil surface. Within short distances downward in the soil, however, temperatures rapidly diminish so that within 2.0 to 3.9 inches (5 to 10 cm) of the soil surface the temperatures are scarcely above ambient temperature (Neary et al. 2005).

The magnitude of these temperature increases depends on the severity of the fire. Residence time of the fire (the duration of heating) is a particularly important feature of fires, affecting the depth and magnitude of soil heating. Effects to soils associated with prescribed burning is influenced by several ecosystem factors including: properties of the fuels (size, flammability, moisture content, mineral content, and so forth) that are available for burning, the relationship of fuels on fire behavior during the ignition and combustion of these fuels, heat transfer in the soil during the combustion of aboveground fuels and surface organic layers (Brown et al. 2000).

During prescribed burning, radiated heat increases would increase soil temperature and causes changes in organic matter and other soil properties. Although the most serious and widespread impacts on soils occur with stand-replacing wildfires, prescribed fires sometimes produce localized problems. Soil structure created as a result of organic matter in the soil can easily be affected by fire for two reasons.

First, the organic matter in a soil profile is concentrated at, or near, the soil surface where it is directly exposed to heating by radiation produced during the combustion of aboveground fuels. Second, the threshold value for irreversible changes in organic matter is low. Living organisms can be killed by temperatures as low as 122 to 140 degrees Fahrenheit (F). Nonliving organic matter begins changing at 224 degrees F and is completely lost at temperatures of 752 degrees F (DeBano 1990). Although prescribed fire would increase soil temperatures and other soil properties, effects would be minimized by applying methods to facilitate low-severity fire, which limits the intensity and duration of operations.

Pile/concentrated slash burning increases the residence time of the fire due to concentrated fuels, which can lead to more consumption of organic matter, higher soil heating temperatures, heating deeper into the soil profile, and thus resulting in isolated patches of severely burned soils directly under the slash pile. Mitigations minimizing to the extent possible the size of the piles and burning during moist soil moisture conditions can reduce these impacts by keeping burn temperatures and soil heating as low as possible. Smaller burn scars tend to recover quicker as well due to the high amount of un-impacted soil around them that contribute to recolonization of soil microorganisms and other soil biota. Burning of hand slash piles should not exceed the detrimentally burned soil standard since individual burn piles are designed to be discontinuous and not greater than 10 feet in diameter.

The purpose of fuel management and prescribed fire activities in the Upper Applegate Watershed Restoration project is to reintroduce fire into a historically fire-adapted landscape, and to make the ecosystems within the area more resilient to impacts from fire over time. Effects to soils from these activities are expected to therefore be within the natural range of variability expected in these fire-adapted ecosystems.

Compaction and Puddling

Proposed activities that can effect soils through compaction and puddling include use of heavy equipment for vegetation treatments and non-motorized and motorized single-track trail construction and use. Unauthorized OHV trail decommissioning would have a beneficial effect through reducing and ultimately eliminating impacts to soil from compaction and puddling by eliminating the illegal use and restoring the trail treads.

Harvest Systems - Logging systems (ground-based, skyline-cable, and aerial) associated with vegetation treatments have the potential to adversely impact soil productivity through detrimental compaction and puddling. Ground-based systems typically have the greatest potential for effects, whereas aerial systems typically have the least potential for adverse effects.

Compaction and puddling from harvest activities is now routinely mitigated, by designating and minimizing the number of skid trails and temporary roads used; by requiring logging equipment to use only those roads and skid trails created during past timber harvest where feasible; using equipment and or techniques shown effective to prevent or minimize compaction (such as low psi (pounds per square inch) or operating on slash to disperse weight); and allowing operations only during conditions when soils are unlikely to be detrimentally compacted beyond the 10% LRMP allowances (such as on dry or frozen ground; or over deep snow with a firm base). In stands that have been previously managed (plantation stands) where commercial thinning is being proposed, requiring re-use of existing templates and implementing restoration actions such as subsoiling to rehabilitate compacted soils address the cumulative detrimental effect to within the requirements in the Forest standards and guidelines for cumulative soils detrimental effects. These mitigations have been proven successful and are being applied to activities being proposed in this project.

Ground-based harvest systems have the greatest potential to adversely affect short and long-term soil productivity. Logging and other equipment can compact and 'puddle' soils over which they operate (landings, skid roads, temporary roads). Tractor, or ground based logging has the greatest potential to cause soil compaction, which decreases soil volume and pore space and modifies soil structure and results in a decrease in gas, water, and nutrient exchange, slows root penetration, and can aggravate soil drought, especially in Mediterranean climates such as that of SW Oregon (Atzet et al. 1989). Treatment methods are designed in each unit to minimize the potential for detrimental impacts to within Forest Plan standards and guidelines.

Using cables to suspend one or both ends of logs as they are pulled from the stand to the landing largely eliminates the potential for compaction and puddling within the stand. What remains, however, is the potential for detrimental soil displacement if one or both ends of the log are dragged across the ground from the stump to the landing. Full suspension (where the log is lifted entirely off the ground during yarding to the landing) and one-end suspension (where one end of the log is allowed to drag along the ground), are effective mitigations that are now regularly employed to minimize detrimental displacement, as well as the use of a pre-designated skid trail or skyline corridor layout.

Helicopter logging has the least impact of all logging systems on soil productivity. This is a form of full suspension, with no part of the log being drug across the ground, except for very short distances as logs are lifted off the ground from a central point between logs. Such logging eliminates any potential for equipment-generated detrimental soil displacement, compaction, or puddling and their attendant erosion effects. Helicopter logging does, however, require larger, though fewer landings. Existing landings would be used for implementation of any aerial harvest units with implementation of this project.

Non-motorized and Motorized Single Track Trails - Through construction and subsequent use over time, soils within trail treads become compacted (i.e. bulk density increases). The level of change in bulk density from natural condition can vary depending on soil textures, and level and type of use. For sandy, coarse textured and very low clay content of granitic soils in parts of the Upper Applegate watershed, compaction is less of an issue than in finer-textured, clayey soils in the majority of the Upper Applegate watershed. Also considering the narrow (average of 2 feet wide), linear nature of the compaction over the landscape, adjacent vegetation is not negatively impacted enough to measurably affect site productivity along trails, particularly at a level that would be considered detrimental. Compaction does not cover a large enough area to impact the productivity of adjacent vegetation. If the trails stopped being used, the narrowness of the compaction along the trail length would be broken up over time through growth of roots from adjacent vegetation into the subsoil of trail treads. Organic matter is typically mostly uniform across the ground and is present except for where annual deposition of overstory litter gets worn away in the active tread of the trail.

Erosion

Proposed activities that can effect soils through the potential for increased erosion include use of heavy equipment for vegetation treatments, prescribed fire, hand and machine pile burning, and non-motorized and motorized single-track trail construction and use.

Road restoration, decommissioning of unauthorized OHV trails, and restoration of the Placer dispersed recreation site would have a beneficial effect through reducing or eliminating erosion issues from bared soil through restoration activities.

Harvest Systems - Logging systems (ground-based, skyline-cable, and aerial) associated with vegetation treatments have the potential to adversely impact soil productivity through detrimental erosion where mineral soil is exposed in skid trails, cable yarding corridors, temporary roads, and landings. Erosion is routinely mitigated by designating and minimizing the number of skid trails and skyline corridors used; requiring a minimum of one-end log suspension to prevent soil gouging; and placing percent slope limitations on ground-based harvest equipment. Additionally, erosion associated with skid trails and skyline corridors can be effectively mitigated by the placement of cross drains (water bars); drainage dips; placement of down wood and slash; and erosion control seeding (or any vegetative cover on exposed soil). Mitigation measures have been specifically designed for this project to minimize soil movement, and no soil movement is expected to extend beyond vegetation treatment units due to effective ground cover requirements, erosion control measures and project design, such as riparian reserve buffers that are known to be effective in preventing erosion that could otherwise result in sedimentation into stream channels.

Prescribed Fire - When fire results in the loss of canopy, litter, and duff cover (moderate to high soil burn severity), it exposes the mineral soil to erosion processes. The litter and duff layers also act as an insulator that protects the underlying soil layers from heating, and if they are consumed, it exposes the mineral soil to greater soil heating impacts. Fire-induced water repellency may occur when combustion of organic matter vaporizes hydrophobic organic substances that then move downward in the mineral soil and condenses into a water repellent layer. This in turn increases risk of soil erosion. Water repellent layers have the greatest impact within the first year after fire, as they tend to break down fairly quickly. Prescribed fire treatments proposed in the Upper Applegate watershed would be designed to mimic historical fire return intervals and help maintain ecosystem conditions that would be consistent with low-mixed severity, fuel limited fire regimes. The majority of the prescribed fire areas would result in a mosaic of low severity and unburned areas, with small pockets of moderate severity that would create openings in forested or brushy stands. Low-mixed severity fire results in the preservation of enough effective ground cover (i.e. duff, litter, woody debris, and litter cast from overstory vegetation) to prevent, or greatly minimize soil erosion to localized areas where soil movement from pockets of exposed mineral soil is quickly intercepted by micro-topography and adjacent intact litter. Observations after one year of the 2017 Burnt Peak Fire, located in the Palmer Creek and Kinney Creek areas of the Upper Applegate watershed, found no erosion in low and moderately burned areas due to intact surface organic matter and effective litter cast, with some localized sheet and rill erosion on steeper slopes of high severity burn that was quickly intercepted in micro-topography (i.e. sprouting shrub and hardwood clumps, stump holes, downed large woody debris) (J. Brazier personal observation, Summer 2018).

Hand and Machine Pile Burning - The burning of individual hand and machine piles results in areas of bared soil due to the consumption of all organic material, as well as potentially causing isolated areas of more easily erodible soils due to loss of soil structure from combustion effects. Hand piles tend to quickly regain effective ground cover due to their small area (less than 10 feet by 10 feet), either through recolonization of vegetation and/or overstory vegetation litter cast, and rarely result in a breakdown of soil structure from intense soil heating. Machine piles regularly result in intense soil heating that can result in sheet and rill erosion from lost soil structure, and the burn scar can stay bared for a longer period of time due to their size and longer vegetation recovery period. Machine piles are most commonly placed on gentle topography associated with landings which further minimizes or prevents soil movement.

Any sheet or rill erosion that may occur within these burn scars is quickly intercepted by micro topography and the residual unburned ring of woody debris that is common around pile burn scars, as well as the surrounding residual woody debris and natural litter immediately adjacent to the burn scars.

Non-motorized and motorized single-track trail construction and use - Sustainable non-motorized and motorized trails that meet Forest Service Trails Management Handbook (FSH 2309.18) policy and guidance result in little to no surface soil erosion due to their location, design and frequently maintained erosion control structures. Non-motorized trails would be maintained at a 12" to 24" trail tread width, and motorized single-track trails would be maintained at 8" to 24" trail tread width, which would be the expected area of bared soil susceptible to erosion. All trails are planned to reuse existing upland roadbeds, mining ditches, or previously abandoned trail routes, except where two re-routes are needed on the Charlie Buck motorized trail proposal to meet sustainable trail design, as well as a sustainably designed motorized connector trail between the 2010200 and 2010300 road. Based on project design criteria and mitigation measures regarding sustainable trail design and erosion control features, and the known effectiveness of adjacent organic matter in capturing and preventing off trail movement of trail tread erosion, it is expected there would be little surface soil erosion, which would be localized to the trail tread.

The proposed motorized single-track trail on proposed on the decommissioned FS Road 2010200 (Hanley Gulch Road), which has an intact roadbed, has six drainage crossings along the proposed length which have had the original road crossings pulled and restored. This roadbed was field reviewed in July of 2018. The roadbed has regularly spaced rolling dips that have been effective in reducing and eliminating road surface sheet-wash and rill erosion as vegetation and litter layers have become established on the roadbed. In the few locations where there was evidence of roadbed soil movement being intercepted at rolling dips, soil movement was immediately intercepted either in the rolling dip or immediately off the shoulder in the forest litter layer. t the six drainage crossing locations, no evidence of erosion was observed off of the roadbed or pulled-back and revegetated drainage crossing locations in their current decommissioned state. The roadbed itself showed no evidence of historic or potential future instability, save for some cutbank scree or slumping in individual locations, primarily related to upslope tree fall that are captured in the road prism.

Establishment of a single-track motorized trail tread on the decommissioned road prism, not including the six drainage crossing locations, with proper erosion control features and maintenance would be expected to function as a sustainable trail that would result in little surface soil erosion which would be quickly captured by trail design features and adjacent vegetation and litter/duff. Any soil movement off the trail tread would not be expected to reach Hanley Gulch below the roadbed due to micro topography, including naturally gravelly/rocky soils, downed wood, and heavy litter/duff on the slopes between the roadbed and Hanley Gulch. In addition, seasonal use restrictions for operation during the dry season only would also minimize erosion potential.

At the six drainage crossings, which are tributaries to Hanley Gulch, there could be the potential for soil erosion off of the trail tread directly into these tributary drainages, depending on channel crossing design. Based on field review at each location, ford crossings would not be able to be designed to guarantee no erosion from loosened trail tread that would reach these drainages and result in sedimentation, due to the steepness of the approaches and the erodibility of the native soils at those gradients. Beaver Creek and its tributaries is a water quality limited stream for sediment. Culvert crossings along Hanley Gulch were removed in 2010-2011 to be in compliance with the Federal Clean Water Act for reducing sediment in this sub-watershed. Furthermore, monitoring results from Wolhman pebble counts show a slight decrease in fine sediment between 1998 and 2013. Therefore, re-installation of culvert crossings is not a feasible option. Instead, a trail bridge design at each crossing is proposed as a project design feature for this trail system, as the most feasible option for guaranteeing the prevention of any erosion from trail tread use reaching their respective drainages. Trail bridge design at each crossing is proposed as a design feature for this trail system, as the most feasible option for guaranteeing the prevention of any erosion from trail tread use reaching their respective drainages.

Organic Matter

Proposed activities that can effect soils through reduction or loss of organic matter include use of heavy equipment for vegetation treatments, prescribed fire, hand and machine pile burning, and non-motorized and motorized single track trail construction and use.

Harvest Systems - Heavy equipment used for vegetation treatments impact organic matter through use of skid trails, cable yarding corridors, temporary roads, and landings. Refer to the discussion under Erosion for more discussion. Project design criteria and mitigation measures minimize this potential impact to within Forest Plan standards and guidelines through minimizing disturbance, and scattering slash or other effective organic ground cover to meet erosion control effective groundcover guidelines where mineral soils are exposed. These actions facilitate the re-establishment of nutrient cycling and other beneficial soil processes that organic matter provides.

Prescribed Fire - With the low-mixed severity prescribed fire designed for this proposed action, surface litter, mosses, and herbaceous plants would be charred-to-consumed, but the underlying forest duff or organic soil would be unaltered. Fine dead twigs up to 0.25 inches (0.6 cm) may be charred or consumed, but larger unburned branches would remain. Logs may be blackened, but would not be deeply charred except where two logs cross. Leaves of understory shrubs and trees would be charred or consumed, but fine twigs and branches would remain. Herbaceous plant bases would not be deeply burned and would still be identifiable. Charring of the mineral soil would be negligible due to the light depth of the burn and the short duration. Organic matter would be reduced. However, the amount of residual matter would be sufficient to provide for other ecological processes.

Hand and Machine Pile Burning - Hand and machine pile burning result in isolated locations of lost organic matter through combustion impacts. Hand piles tend to recover quickly due to their small scale, less intense soil heating impacts, and relatively quick re-establishment of vegetation and litter cast in the burn scar. Large machine pile scars tend to have a more prolonged negative effect regarding the loss of surface as well as soil organic matter (intense soil heating and charring down into the surface soil layers that consumes organic matter within the soil layer). These burn scars often take decades to slowly build back organic matter equivalent to neighboring soil.

Non-motorized and Motorized Single Track Trails - Through construction and subsequent use over time, soils within the active trail tread of single track trails would be impacted by loss of organic matter. Organic matter is typically mostly uniform across the ground and is present except for where annual deposition of overstory litter gets worn away in the active tread of the trail. Considering the narrow (average of 2 feet wide), linear nature of the active tread over the landscape, adjacent vegetation and litter layers is not negatively impacted enough to measurably affect site productivity along trails, particularly at a level that would be considered detrimental for organic matter.

The cumulative effects analysis area for the soil resource are the locations of all of the proposed activities in the Upper Applegate watershed, and areas downslope of these areas that could be impacted by soil movement. This cumulative effects analysis area is considered sufficient because effects to a particular soil is localized to the defined area where direct and indirect effects can be measured.

Past actions in these areas which still have the potential for residual effects to soils that overlap the Proposed Action include past timber management and wildfires. The 2017 Burnt Peak wildfire is within the Upper Applegate watershed between Palmer and Kinney Creeks. Detrimental effects from this fire would be primarily the loss or reduction of surface organic matter that provides nutrients, water retention, and effective ground cover from erosion on high severity sites. No proposed treatments that would have the potential for any negative direct or indirect effects would intersect these high severity areas of the fire and result in cumulative effects.

The Rogue River National Forest Land and Resource Management Plan establishes that the total area of detrimental soil conditions should not exceed 10 percent of the total acreage within the activity area, not including the permanent road system. The cumulative detrimental effect to soils from other actions must not exceed 20 percent. Where an area already exceeds 20 percent from prior activities, the Region 6 Manual requires that "the cumulative detrimental effects of project implementation and restoration must, at a minimum, not exceed the conditions prior to the planned activity and should move toward a net improvement in soil quality" (USFS 1998). During preparation for implementation, treatment methods are designed to assure that soil detrimental disturbance will not exceed these Standards and Guidelines. In areas where there are residual past effects, then the re-use of old disturbance areas to the maximum extent possible helps to prevent an increase in the acres. In addition, required mitigation measures to improve effective ground cover and water infiltration, such as through slash placement and subsoiling, improve the disturbed areas and set the soil resource on a trajectory of restored soil productivity.

I. HYDROLOGIC FUNCTION

Activities associated with restoration treatments and new trail development, along with other connected actions, may affect hydrologic conditions within the Project Area, including channel morphology, runoff, stream flow, temperature, quantity and quality of water sources, peak flows, and listing status for Oregon Department of Environmental Quality (303(d) listed waterbodies.

The Upper Applegate watershed (UAW) is located entirely in one 5th field watershed known as the Upper Applegate River watershed which is within the Applegate Sub-basin. The three sub-watersheds (6th field) are shown in Table 8. Beaver Creek and Palmer Creek 6th field Sub-watersheds are Tier 1 Key Watersheds as defined in the Northwest Forest Plan (USDA, USDI 1994).

The landscape within the Upper Applegate watershed is highly dissected characterized by numerous streams and draws. The Upper Applegate Watershed Restoration Project is located within three 6th field sub-watersheds in the Applegate Sub-basin.

Table 8. Upper Applegate Sub-watersheds

Sub-Watershed	Total Acres	Stream Density (mi./sq. mi.	Open Road Density (mi./sq. mi.
Beaver	17,504	2.94	1.93
Palmer	18,684	4.26	2.18
Star Gulch	16,113	4.60	1.44

There are approximately 319.85 total miles of stream in the Upper Applegate watershed. There are 45.69 miles of perennial, fish bearing streams; 58.5 miles of perennial, non-fish bearing streams; and 215.66 miles of intermittent and ephemeral streams. The drainage density is 3.92 miles of stream per square mile of the Upper Applegate watershed.

There are 153 miles of roads across all ownerships within the Upper Applegate watershed. Beaver Creek tributaries with the highest classified road densities include Hanley Gulch (4.64 mi./sq. mi.), Haskins Gulch (4.18 mi./sq. mi.), Beaver Creek headwaters (3.98 mi./sq. mi.), Baldy Creek (3.44 mi./sq. mi.), and Charley Buck Gulch (3.30 mi./sq. mi.).

As part of the Water Quality Restoration Plan (USDA 2005), road decommissioning was completed during 2010-2011. The road density in the Applegate River – Beaver Creek sub-watershed has been reduced from approximately 3.22 mi per square mile for Forest Service system roads to 1.93 miles of road per square mile. For the UAWRP area (5th field HUC), road density is currently at 1.87 miles of road per square mile. Watershed slope influences the potential for groundwater interception and redistribution of flows. Watershed relief is determined by calculating the difference in elevation between the highest and lowest points of the basin divided by the length of the basin in a line approximately parallel to the major drainage. Watershed risk can be evaluated by assessing road density relative to overall watershed relief (UDSA 1993). The Upper Applegate watershed is in the low watershed risk category because watershed relief is less than 30% and current road densities are less than 3.0. If watershed relief is greater than 30%, a road density of less than 2.0 is considered low risk. If watershed relief is less than 30%, a road density of less than 3.0 is considered low risk (UDSA 1993).

The stream types and miles included in the Upper Applegate watershed are displayed in Table 9 below.

Table 9. Stream Type and Miles

Sub-watershed	Length (Miles)
Perennial, Fish Bearing	
Beaver Creek	15.28
Palmer Creek	16.27
Star Gulch	14.14
Total	45.69
Perennial, Non-Fish Bearing	
Beaver Creek	27.27
Palmer Creek	11.57
Star Gulch	19.66
Total	58.50

Intermittent or Ephemeral	
Beaver Creek	37.63
Palmer Creek	96.67
Star Gulch	81.36
Total	215.66
All Streams Total	319.85

Streamflow within the Upper Applegate watershed reflects the precipitation pattern and runoff lags about a month behind the precipitation. According to the Applegate River Watershed Assessment, approximately 80% of the annual precipitation falls from November through April, thus about 80% of the runoff occurs from December through May (USDI, USDA 1995). Flow data is limited to streams with past and/or current gage stations. Data from the Star Gulch gaging station showed that flows ranged from 1400 cubic feet per second (cfs) during storm events to 0 cfs during low flow (USDA 1994). On the Applegate River, streamflow has been regulated since 1980 by releases from Applegate Dam (USDI, USDA 1995) (USGS NWIS). Mean monthly discharge from October 1981 to September 2006 show that mean monthly flows ranged from 236 cfs in August to 749 cfs in January (USGS NWIS). There are no flow records for the other streams within the Upper Applegate watershed. Some of the perennial streams have such low flow in the summer months that measuring flow is not warranted. For example, the Squaw/Elliot/Lake Watershed Analysis notes that Mule Creek is dry by June in most years and summer flows in Kinney Creek are so low they can be measured in terms of gallons per minute (USDA 1995).

According to watershed analyses, streams within the Upper Applegate watershed have been altered from past human activities, including extensive hydraulic and placer mining, timber harvest, road building, grazing, and agriculture. The effects from some of these activities are currently still present (USDA 1994, USDI, USDA 1995, USDA 1995, USDI 1998). For example, the Beaver Palmer Watershed Analysis states that cobble is the dominant substrate size in Palmer Creek and there are large tailing piles in the flood-prone area, constricting the active channel. Stream sinuosity had been reduced and channel incision has occurred from effects of past hydraulic mining activities (UDSA 1994).

Several restoration projects have been and continue to be implemented in the Upper Applegate River watershed to address past impacts. These restoration projects are described in the Aquatic Restoration Plan and include channel and bank construction, road decommissioning, instream large wood placement, and other activities (USDA 2006).

Channel Morphology-Physical Characteristics

Applegate River - The Applegate River is the second largest tributary to the Rogue River. The Applegate River within the Upper Applegate watershed is characterized as a low gradient unconfined alluviated valley. Typically, streams located in this type of valley are sinuous with connected floodplains. The dominant bed material is gravel and cobble and there is a meandering stream channel. Along the Applegate River (as with other valley sections throughout the area) to maximize useable land for homes and agriculture, riparian vegetation is cut and the stream is straightened. The stream responds by down cutting, creating steep streambanks and becoming dissociated from the floodplains. Areas that were previously depositional zones have become transport zones and have effectively removed gravels from the system (USDI, USDA 1995).

Palmer Creek - In the Beaver Palmer Watershed Analysis, most of Palmer Creek was characterized as a Rosgen B3 stream type, while only the Upper Palmer Reach was identified as an A3 stream type. The Rosgen classification system is a method of describing physical stream characteristics. In this classification system, the B3 stream type is moderately entrenched, has a moderate gradient, is riffle dominated and has infrequently spaced pools. The dominant bed material is cobble. This stream type also has a stable plan and profile and stable banks (Rosgen 1996). The portion of Palmer Creek within the Upper Applegate watershed is a B3 (USDA 1994). Large wood has been added to sections of Palmer Creek during the past decade and has provided local habitat benefits. Habitat complexity has increased in these selected sites providing much needed rearing and spawning habitat (USDA 2006).

Beaver Creek - The portion of Beaver Creek within the Upper Applegate watershed was characterized as a Rosgen F3 stream type in the Beaver Palmer Watershed Analysis. The F3 stream type is wide and shallow, entreched, and highly channelized with an abandoned floodplain (Rosgen 1996). The dominant bed material is cobble (1996) (USDA 1994), although there are also inclusions of bedrock. There are sections of Beaver Creek where large wood has been placed, changing the site from a bedrock-dominated substrate to cobble and gravel. Habitat complexity has increased in these selected sites, providing much needed rearing and spawning habitat (USDA 2006). Road decommissioning along with culvert removal occurred during 2010-2011 as part of the Forest obligation to the Clean Water Act and having Beaver Creek placed on the TMDL list for sediment impairment. Beaver Creek is still in recovery from having a high road density network. Results from monitoring (Wohlman pebble count) in 1998 and 2013 show a slight decrease in the amount of fine sediment.

Star Gulch - In general, Star Gulch is a moderate to high gradient channel located in a narrow, steep valley (USDA 2006). The lower portion of Star Gulch is within the Upper Applegate watershed. According to the Applegate-Star/Boaz Watershed Analysis, this section of Star Gulch is characterized as a Rosgen B stream type (Rosgen 1996). This portion of the stream has a moderate stream gradient and is moderately entrenched. Riffles are the dominant feature and there are infrequently spaced pools. The banks are stable and the stream is located within a narrow, gently sloping valley (USDI 1998). Past mining effects are still present today as the lower reach is confined by mine tailings and rock berms. Gravel, cobble, boulder, and bedrock make up the majority of substrate present, while fine substrate accounts for 10% or less of all substrate present in the lower section of Star Gulch (USDA 2006). Large wood is generally lacking (USDI 1998, USDA 2006). Although Star Gulch is mostly managed by the Medford Bureau of Land Management (BLM), the Forest Service manages a ¾ mile stream segment in the lower sub-watershed (USDA 2006).

Other Streams - Information on channel morphology for the remaining streams within the Upper Applegate watershed is limited. Neither Level 2 Stream Surveys nor Rosgen Level II surveys have been conducted. In addition, the watershed analyses that included these streams did not have any specific information on physical characteristics for these streams.

Water Quality

Several streams in the Upper Applegate watershed were considered water quality limited by the Oregon Department of Environmental Quality (ODEQ) and were placed on the 303(d) list in 1998. Table 10 identifies the streams, the parameters for which they were listed, and the section of stream listed (river mile). In 2003, a Total Maximum Daily Load (TMDL) and associated Water Quality Management Plan (WQMP) was developed.

The WQMP includes a strategy for implementing and achieving the TMDL and identifies the "designated management agencies" (DMAs). The Forest Service is one of the DMAs and is responsible for land uses on Forest Service-managed land addressed in the NWFP, associated Aquatic Conservation Strategy, and WQMP for the Applegate Sub-basin. Attainment of the TMDL would occur through implementation of the WQMP (ODEQ 2003). In 2004, the TMDL and WQMP were approved by EPA.

Designated Beneficial Uses as defined under Section 303(d) of Clean Water Act include: domestic water supply, irrigation, livestock watering, fish and aquatic life, wildlife, fishing, boating, and water contact recreation..

Table 10. Water Quality Limited Streams

Stream	Parameter	River Mile
Applegate River	Temperature	0 to 46.8
Beaver Creek	Sedimentation Biological Criteria	0 to 8.8
	Temperature	0 to 8.8
	Biological Criteria	0 to 8.8
Palmer Creek	Temperature	0 to 5.7

Stream Temperature - In the Applegate Sub-basin Temperature TMDL, ODEQ identified that for nonpoint sources the load allocation is system potential vegetation quantified as average percent shade. Current and future shade was modeled for every perennial stream in the sub-basin (ODEQ 2003).

Of the streams on Forest Service-managed lands within the Upper Applegate watershed, Beaver Creek, Brushy Gulch, Mule Creek, Rock Gulch, and Waters Gulch have a current shade value of greater than 80% effective shade. Future shade values show an increase in shade over 80% to account for a margin of safety. The Clean Water Act requires that each TMDL be established with a margin of safety. The margin of safety accounts for uncertainty in available data or in the actual effect controls will have on loading reductions. At a value of greater than 80% effective shade, a stream is considered recovered and the stream should not be a candidate for active restoration. Additional shade will come from passive management of the riparian area. The Applegate River, Kinney Creek, Palmer Creek, and Star Gulch have effective shade values less than 80%. Current shade on the Applegate River is 4%, Kinney Creek is 76.8%, Palmer Creek is 79.1%, and Star Gulch is 60%. For these streams, the TMDL describes the time to recovery as the time needed to reach full system potential percent effective shade (ODEQ 2003).

Main-stem channels can often have low stream shade values because these channels are too wide (exceeding 100 feet in active channel width) for riparian area trees to shade. This is the case on the Applegate River where the active channel width ranges from 150 to over 580 feet. ODEQ identified the current shade value as 4% and the future shade value as 13% (ODEQ 2003). On wide main-stem channels there is little or no opportunity to improve vegetative stream shading. Opportunities for shade improvement occur mainly along tributaries to main-stem channels.

Sedimentation - The Applegate Sub-basin Sedimentation TMDL addresses the 1998 listing of Beaver Creek. The numeric target of less than or equal to 33% cobble embeddedness has been identified as the loading capacity for Beaver Creek. To achieve the loading capacity and meet the TMDL, ODEQ identified the surrogate measures as 1) system potential riparian vegetation for the length of Beaver Creek, 2) road density targets set for each drainage, and 3) road-stream crossing targets set for each drainage (ODEQ 2003).

The sediments found in Beaver Creek may be from nonpoint sources associated with forestry activities, roads and road/stream crossings, and agricultural maintenance of riparian areas (ODEQ 2003). Specific human-caused processes on federal lands that have likely contributed to sedimentation in Beaver Creek include: surface erosion from roads; ditches accelerating peak flows; road/stream crossings; increased peak flows, bank erosion, and surface erosion from timber harvest; and increased mass wasting from timber harvest. Sediment inputs are dependent on quantity and intensity of precipitation. Winter is the time of maximum sediment input and maximum movement of sediments through the system, however, impacts from sediment are yearlong.

The system potential riparian vegetation surrogate measure is identical to the targets set in the Temperature TMDL. Thus, the measures implemented to meet the Temperature TMDL would also meet the surrogate measure targets for the sedimentation TMDL. ODEQ determined that Riparian Reserve widths as required by the NWFP may be larger than the reserves needed to satisfy percent-effective shade targets (ODEQ 2003). Riparian Reserves would be 150 feet on either side of non-fish bearing streams and 300 feet on either side of fish bearing streams. In the Sedimentation TMDL, ODEQ noted that this reserve width may be larger than that required to meet percent-effective shade targets, but would provide additional protections from sediments (ODEQ 2003).

Long term road density targets were identified by ODEQ for the Beaver Creek and its tributaries. Road decommissioning occurred during 2010-2011 and road density targets have been met. Applegate River-Beaver Creek sub-watershed has seen a 40% reduction in road density.

The target crossing frequencies were determined by ODEQ to be 2.0 crossings per stream mile and 3.0 crossings per road mile. Those targets have mostly been met during road decommissioning activities during 2010-2011 in the Upper Applegate watershed.

Biological Criteria - The Applegate Sub-basin Biological Criteria TMDL includes Beaver Creek from its mouth to the headwaters due to the impairment of macroinvertebrate populations. This listing is the result of habitat limitations created by an excess of fine sediments and excessive summertime temperatures. The TMDL does not directly set loading capacities for biological criteria because TMDL allocations for the temperature and sedimentation TMDLs (See sections above) are expected to restore the condition of biological communities (ODEQ 2003).

The designation of Beaver Creek as exceeding biological criteria due to excessive sedimentation and the resulting placement on the 303(d) list resulted from a macroinvertebrate study performed in 1991. The study concluded that macroinvertebrate populations in Beaver Creek were impaired due to excessive fine sediments (USFS 1994, ODEQ 2003). The site that was sampled appeared to have a long history of impairment from logging, roads, and catastrophic floods. Since this study, macroinvertebrate trends indicate habitat conditions are static or improving under the current management. Despite this, moderate to higher than optimal fine sediment and excessive summer temperatures are still causing macroinvertebrate population impairments (ODEQ 2003).

Turbidity - Turbidity, or the loss of water clarity, is due to the presence of suspended particles of silt and clay. Other materials, such as finely divided organic matter can also contribute to the loss of water clarity. At this time, none of the streams within the Upper Applegate watershed have been placed on the 303(d) list for turbidity. Overall, there has been little turbidity data collected on the streams in the Upper Applegate watershed.

Turbidity data collected on Star Gulch from 1982 to 1996 is summarized in the Applegate-Star/Boaz Watershed Analysis. Turbidity was determined to be generally very low in Star Gulch. High turbidities were associated with storm events and subsequent higher flows (USDA 1998). Observations of increased turbidity during high flow events have also been documented in other watershed analyses that cover the Upper Applegate watershed (USDA 1995).

Channel Morphology

Under the current condition, natural recovery and processes would continue to occur. If a high-severity, stand replacement wildfire occurred in Riparian Reserves, there could be an increase of coarse sediment. Erosion triggered by this type of wildfire could cause channel changes, such as pool filling, channel widening, and stream bank failures. Channel widening could have subsequent effects on water quality by causing increases in stream temperature.

Coarse sediment, sands, and gravels are transported in a stream as bedload. Excessive amounts of coarse sediment in a stream as compared to the stream's ability to transport it can cause channel changes such as pool filling, channel widening, and stream bank failures. Logging activities can increase the rate of erosion through soil displacement by logging equipment, cable yarding, and skidding of logs.

To detect changes in channel morphology from sediment delivery following riparian thinning and burning, photo points were established on a stream prior to activities for the 1995 Waters Thin Project. Monitoring sites on the stream included areas sensitive to increases in sediment delivery and flow from the project activities. This included a pool, a vertical stream bank on a bend, and a vegetated low gradient section. In January 1997, two years after the project activities, there was a 50-year storm event. Comparison of the 1995 and 2005 photo points showed no change in the stream channel. There were no sediment deposits in the pool or low gradient stream section. The stream bank was unchanged. No evidence of sediment movement was present in the 25-foot no treatment area or in the riparian area where thinning and burning occurred (Park and Jubas 2005). Based on the similarity in treatments between the Waters Thin Project and activities in the Proposed Action, no effects from coarse sediment as a result of thinning and prescribed burning would be expected.

Fine sediment delivery, not coarse sediment, is associated with haul and maintenance (see Water Quality discussion). No coarse sediment delivery to a stream would occur from haul of logs and road maintenance.

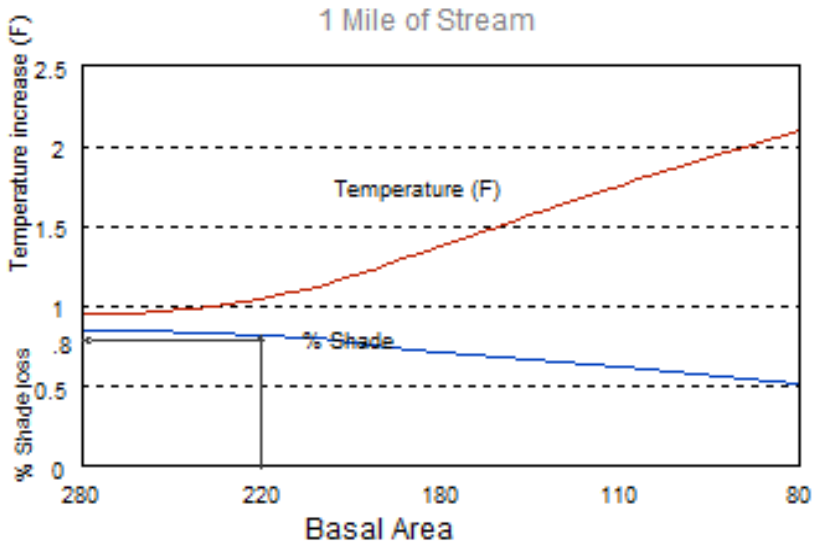
Water Quality

Natural recovery and processes would continue to occur under the current condition. The composition and character of forest stands adjacent to streams would not be altered. Thus, there would be no effect to stream shading and no change to stream temperature. The risk of a high-severity, stand replacement wildfire would remain unchanged in overstocked stands which could result in extensive mortality within Riparian Reserves if this type of fire occurred. Stand replacement wildfire could reduce the supply of future large wood recruitment and reduce stream shade. Therefore, there could be an indirect effect on stream temperature in the Upper Applegate watershed. There could also be effects to stream temperature from channel widening (See Channel Morphology).

Indirect effects could occur from the increased risk of a high-severity, stand replacement wildfire in Riparian Reserves. This disturbance could trigger erosion and increase fine sediment inputs to stream channels. This could have adverse impacts on turbidity. Additionally, there could be effects to macroinvertebrates and dissolved oxygen. Increases in temperature and fine sediment inputs to streams could affect macroinvertebrate populations, and therefore, the ODEQ 303(d) listing for biological criteria. Dissolved oxygen could be impacted by increases in stream temperature through loss of stream shading or channel widening from increased coarse sediment delivery.

Under the Proposed Action, thinning can remove trees that are providing stream shade which can increase summer stream temperatures. Figure 11 illustrates the effects of riparian thinning (e.g., reduced basal area) on increasing stream temperature.

Figure 11. Modeled effects of thinning on stream temperature (SHADOW).



Implementation of the Northwest Forest Plan accommodates vegetation treatment necessary or desirable to restore ecological health in Riparian Reserves that have been harvested or affected by fire exclusion or other disturbance. The Northwest Forest Plan Temperature Strategy, developed for the Forest Service, Bureau of Land Management and Oregon Department of Environmental Quality, demonstrates that thinning can occur in the Riparian Reserve without affecting stream shade if the overstory canopy in the primary shade zone is not treated.

No impacts to stream temperature would be expected from thinning because existing stream shade would be maintained.

There is no new road construction proposed in this project. There would be a maximum of 3,000 feet of temporary road construction. Temporary roads would be defined as a created travel way, for the purpose of transporting logs that is built, utilized, and decommissioned (obliterated) over the course of the treatment. Obliteration of these roads would occur at the completion of their intended use. Temporary roads would not be located within Riparian Reserves or within 100 feet of ephemeral streams. Therefore, there is no loss of vegetation within the primary shade zone and no effect to stream temperature from temporary roads.

Fuels treatment (non-commercial thinning, pile burning, and underburning) in Riparian Reserves would be accomplished by manual thinning and backing prescribed fire into the riparian area. Ignition points would not occur closer than 100 feet from perennial streams. In addition, no hand piles would be burned within 25 feet of a stream.

Non-motorized and motorized single-track trail construction and use

All trails proposed under the Proposed Action are designed to reuse existing upland roadbeds, mining ditches, or previously abandoned trail routes, except where two short re-routes are needed on the Charlie Buck motorized trail proposal. Based on project design criteria and mitigation measures regarding sustainable trail design and erosion control features, and the known effectiveness of adjacent organic matter in capturing and preventing off trail movement of trail tread erosion, it is expected there would be little surface soil erosion, which would be localized to the trail tread.

The proposed motorized single-track trail on Forest Service Road 2010200 (Hanley Gulch Road), which is a decommissioned road with an intact roadbed, has six drainage crossings along the proposed length which have had the original road crossings pulled and restored. This roadbed was field reviewed in July of 2018. The roadbed has regularly spaced rolling dips that have been effective in reducing and eliminating road surface sheet and rill erosion as vegetation and litter layers have become established on the roadbed. In the few locations where there was evidence of roadbed soil movement being intercepted at rolling dips, soil movement was immediately intercepted either in the rolling dip or immediately off the shoulder in the forest litter layer. At the six drainage crossing locations, no evidence of erosion was observed off of the roadbed or pulled-back and revegetated drainage crossing locations in their current decommissioned state. The roadbed itself showed no evidence of historic or potential future instability, save for some cutbank scree or slumping in individual locations, primarily related to upslope tree fall that are captured in the road prism (Soil Specialist report).

Establishment of a single-track motorized trail tread on the 2010200 road prism, not including the six drainage crossing locations, with proper erosion control features and maintenance would be expected to function as a sustainable trail that would result in little surface soil erosion which would be quickly captured by trail design features and adjacent vegetation and litter/duff. Any soil movement off the trail tread would not be expected to reach Hanley Gulch below the roadbed due to micro topography, including naturally gravelly/rocky soils, downed wood, and heavy litter/duff on the slopes between the roadbed and Hanley Gulch. In addition, seasonal use restrictions for operation during the dry season only would also minimize erosion potential (Soil Specialist report).

At the six drainage crossings, which are tributaries to Hanley Gulch, there could be the potential for soil erosion off of the trail tread directly into these tributary drainages, depending on channel crossing design. Based on field review at each location, ford crossings would not be able to be designed to guarantee no erosion from loosened trail tread that would reach these drainages and result in sedimentation, due to the steepness of the approaches and the erodibility of the native soils at those gradients. Beaver Creek and its tributaries is a water quality limited stream for sediment. Culvert crossings along Hanley Gulch were removed in 2010-2011 to be in compliance with Federal Clean Water Act for reducing sediment. Furthermore, monitoring results from Wolhman pebble counts show a slight decrease in fine sediment between 1998 and 2013.

Therefore, re-installation of culvert crossings is not a feasible option. Instead, a trail bridge design at each crossing is proposed as a project design feature for this trail system, as the most feasible option for guaranteeing the prevention of any erosion from trail tread use reaching their respective drainages.

The Applegate Sub-basin Biological Criteria TMDL includes Beaver Creek due to the impairment of macroinvertebrate populations. This listing is the result of habitat limitations created by an excess of fine sediments and excessive summertime temperatures. The TMDL does not directly set loading capacities for biological criteria because TMDL allocations for the temperature and sedimentation TMDLs are expected to restore the condition of biological communities (ODEQ 2003). Since there would be no increase in stream temperature or sediment from the proposed action, no effects to biological criteria would be expected.

J. CUMULATIVE WATERSHED EFFECTS

Activities associated with restoration treatments and new trail development, along with other connected actions, in combination with past, other current, and reasonably foreseeable future actions, may result in adverse cumulative watershed effects to hydrologic function and water quality.

On the Klamath National Forest (Forest Service Region 5), an approach entitled the *Equivalent Roaded Area (ERA) Methodology* (UDSA FS 1999) has been utilized for assessing relative risk of cumulative watershed effects. It is important to note that the scope of the analysis of existing conditions at the sub-watershed scale is dependant on the nature of the historic and ongoing effects and the availability of data for the watershed being analyzed. The *ERA Methodology* was used to assess the cumulative watershed effects of past, present, and reasonably foreseeable future activities in the Palmer Creek, Beaver Creek, and Star Gulch Creek sub-watersheds. This method was selected because the data needed to run the *ERA* model was available and consistent throughout the watershed analysis areas.

Recent environmental analyses completed by the Rogue River-Siskiyou NF has utilized a methodology referred to as the *CWE Methodology*. This model, sometimes referred to as the "Section 7" model, was used to aid in consultation with the National Marine Fisheries Service (NMFS) under Section 7 of the Endangered Species Act. The Forest Service developed the CWE Methodology for assessing the relative risk of adverse cumulative watershed effects in response to a request from NMFS (USDA FS 1993). Although, the CWE Methodology has been commonly used in Forest Service Region 6, this analysis uses only the ERA Methodology to assess past, current, and future activities. The cumulative effects analysis process described in this document is primarily based on information (data) from the Rogue River-Siskiyou National Forest Geographic Information System (GIS) databases. The analysis was primarily performed using ArcMap, a GIS software.

Equivalent Roaded Area Methodology

The *ERA Methodology* utilizes GIS analysis of land use activities to convert road, timber harvest, fire, and other disturbances within each watershed to equivalent roaded areas based on predetermined coefficients that are regionally specific. The resulting equivalent roaded area within each watershed is divided by the area of each watershed to calculate a relative disturbance rating, which is called the percent ERA. Then, the percent ERA is compared to the Threshold of Concern (TOC) for each watershed. Finally, the calculated TOC is compared to the percent ERA for each watershed to determine a watershed Risk Ratio.

The following discussion describes the process and displays the values for each sub-watershed analysis area.

Equivalent Roaded Area (ERA) Coefficients

To determine ERA, coefficients for disturbance classes are compared to values for roads to calculate the area of road that would produce the same change in peak flows. The information is used to create a table of Equivalent Roaded Area coefficients. Coefficients have been adjusted over time based on experience by resource specialists.

Satellite imagery was used to develop a disturbance map for the affected sub-watersheds. Various vegetation classes from the imagery were assigned an ERA coefficient (see Table 11). Refer to the cumulative effects analysis performed for the Mt. Ashland Ski Area Expansion FEIS for a discussion on how the coefficients were derived. The following table displays the coefficients used to model the satellite imagery in the Upper Applegate watershed:

Table 11. ERA Coefficient by Vegetation Type

Description		ERA Category	Coefficient
Late seral forest	Greater than 60% canopy closure, greater than 24" DBH	Federal lands - Undisturbed	0
		Outside federal lands – Moderate disturbance, 0-20 years old	0.11
	Less than 60% canopy closure, greater than 24" DBH	Federal lands - Moderate disturbance, 20-30 years old	0.06
		Outside federal lands – Moderate disturbance, 0-20 years old	0.11
Mature forest	Greater than 60% canopy closure, 11 - 24" DBH	Federal lands - Undisturbed	0
		Outside federal lands – Moderate disturbance, 0-20 years old	0.11
	Less than 60% canopy closure, 11 - 24" DBH	Federal lands - Moderate disturbance, 20-30 years old	0.06
		Outside federal lands – Moderate disturbance, 0-20 years old	0.11
Immature forest	Greater than 60% canopy closure, 6 - 11" DBH	High disturbance. 30-40 years old	0.06
	Less than 60% canopy closure, 6 - 11" DBH	High disturbance, 20-30 years old	0.17
Seedling/sapling	0 – 6 " DBH	Moderate disturbance, 0-20 years old	0.11
Shrub/grass/forb[1]		Federal lands	0
		Outside federal lands – Moderate disturbance, 0-20 years old	0.11
Barren[2]		Federal lands	0.5
		Outside federal lands – High disturbance	1.0
Roads		Natural or aggregate surface	1.0
Non-erodible		Paved road	1.0
Private	Includes lands outside NFSL that are not otherwise mapped in another category	High disturbance 0-20 years old	0.21

Description	ERA Category	Coefficient
[1] Assumes shrub and grass/forb communities within federal lands are recovered or in an undisturbed, natural condition. These vegetation types located outside federal lands are assumed to be moderately disturbed.		
[2] Does not include some naturally barren ground. For analysis, assumes that 50% of land mapped as barren on NFSL is a result of mechanized treatment or is a disturbed condition. On lands outside federal lands, analysis assumes 100% disturbed.		

For this analysis of current condition, it was assumed that lands outside the National Forest boundary were all disturbed in the last 20 years. This is a conservative assumption due to the lack of current data on privately owned lands. The approach used for this analysis of cumulative effects generally over-estimates disturbance levels and as such, is a conservative approach that would take a "worst case" look at watershed effects. An example is the stands mapped as being less than 60% canopy closure. These were assumed to be in this condition as a result of treatment, when if fact, many are naturally occurring.

Cumulative effects analysis begins with past and present actions. Many of the past activities are accounted for in the vegetative mapping that was used (i.e. past timber harvest), as described by the current condition. Projects that have occurred since the mapping was completed or that are ongoing were accounted for in the analysis. Past actions, though not specifically listed by name, provide an opportunity to understand the current condition of the watersheds analyzed in this report. Other actions that have occurred on federal lands that are not shown on the map include fire suppression, maintenance, recreation trail construction and reconstruction, and various removal of individual trees as well as roadside hazard tree removal

Based on analysis of past and present actions and the current condition, the following percent ERA values were determined for the sub-watershed analysis areas:

Table 12. Current Percent ERA by Sub-watersheds

	Palmer	Beaver	Star Gulch
Total acres	18,684	17,504	16,113
ERA	827	864	961
Percent ERA	**5.13%**	**4.62%**	**5.49%**

The percent ERA for each of the three sub-watersheds are relatively similar ranging from 4.62 % in Beaver to 5.49% in Star Gulch perhaps due to an increase in private lands.

Threshold of Concern (TOC)

The TOC is developed specifically for each watershed and is based on channel sensitivity (C), beneficial uses (B), soil erodibility (E), hydrologic response (H), and slope stability (S). The *ERA Methodology* contains detailed evaluation techniques that are described below to determine the numerical index for each of the factors. Once the index values have been determined for each watershed, the Watershed Sensitivity Level (WSL) is calculated using the following the equation: WSL = 3C + 2B + E + H + S. Next, the WSL is converted to a watershed specific TOC value based on the equation: TOC = (43 – WSL) / 2. The number "43" is used because it best fits a regression of the watershed sensitivity levels and previously determined TOCs on the Klamath NF which has similar conditions as the Upper Applegate watershed. Following is a discussion of each of the factors used to determine the TOC values for each of the sub-watershed analysis areas:

Channel Sensitivity (C)

This is based on Pfankuch stream stability ratings for the primary streams and major tributaries through each watershed. Since Pfankuck ratings are not available in most streams across the forest, professional judgment is used in most cases. Generally, streams are considered moderately sensitive unless there are indications otherwise.

Table 13. Channel Sensitivity Rating

Parameter	Sensitivity Class	Index	Pfankuch Rating
Channel Sensitivity	Very High	5	>130
	High	4	115-130
	Moderate	3	77-114
	Low	2	39-76
	Very Low	1	<39

Beneficial Use (B)

Five beneficial use stream classes are defined in the Klamath NF Land and Resource Management Plan. A Class 1A stream is a highly productive anadromous stream or is a municipal or campground water source. Class 1B streams are moderately productive anadromous streams, highly productive resident streams, or are used for individual domestic use, Class 2 streams have little or no anadromous habitat but some resident fish habitat, Class 3 streams have a little resident fish habitat, and Class 4 streams have no beneficial uses.

Table 14. Beneficial Use Descriptions

Parameter	Significance Class	Index	Description
Beneficial Use	Very High	5	Contains the entire drainage of a Class 1A stream
	High	4	Contains 25% or more of the drainage area of a Class 1A stream or the entire drainage of a Class 1B stream
	Moderate	3	Contains 5% or more of the drainage area of a Class 1A stream, 25% or more of a Class 1B stream, or the entire drainage of a Class 2 stream
	Low	2	Contains 1% or more of the drainage area of a Class1A stream, 5% or more of a Class 1B stream, 25% or more of a Class 2 stream, or the entire drainage of a Class 3 stream
	Other	1	Does not meet the criteria of any previous category

Soil Erodibility (E)

This index is based on the inherent sensitivity of the soils to surface erosion. This factor is computed by running the Universal Soil Loss Equation (USLE) model on watersheds to arrive at a background (assuming no disturbance) surface erosion volume in cubic yards per acre per decade.

Table 15. Soil Erodibility Index

Parameter	Sensitivity Class	Index	Background Erosion Volume
Soil Erodibility	Very High	5	Greater than 0.115 cy/acre per decade
	High	4	Between 0.081 and 0.115 cy/acre per decade
	Moderate	3	Between 0.055 and 0.081 cy/acre per decade
	Low	2	Between 0.041 and 0.055 cy/acre per decade
	Very Low	1	Less than 0.041 cy/acre per decade

Hydrologic Response Potential (H)

This index is based on the percent of the sub-watershed in the rain-on-snow zone, which is between 3,500 and 5,000 feet in elevation.

Table 16. Hydrologic Response Index

Parameter	Peak Runoff Potential	Index	Description
Hydrologic Response	High	4	Rain on snow zone > 50% of the watershed
	Moderate	3	Rain on snow zone 25-50% of the watershed
	Low	2	Rain on snow zone < 25% of the watershed

Slope Stability (S)

This factor is based on the inherent sensitivity of the watershed to landslides. The index is computed by running the landslide model on watersheds to arrive at a background (assuming no disturbance) landslide volume in cubic yards per acre per decade.

Table 17. Slope Stability Index

Parameter	Risk Class	Index	Stability Rating
Slope Stability	Very High	5	Greater than 3.2 cy/acre per decade
	High	4	Between 2.6 and 3.2 cy/acre per decade
	Moderate	3	Between 2.0 and 2.6 cy/acre per decade
	Low	2	Between 1.0 and 2.0 cy/acre per decade
	Very Low	1	Less than 1.0 cy/acre per decade

The following table displays the TOC values by sub-watershed that were determined by resource specialists that was used for this analysis:

Table 18. Threshold of Concern Values by Watershed

Watershed	Beneficial Uses	Channel Stability	Soil Erodibility	Hydrologic Response	Slope Stability	Watershed Sensitivity Level	Threshold Of Concern
Palmer	3	3	2	2	3	22	10.5
Beaver	2	3	2	2	3	20	11.5
Star Gulch	2	3	2	2	3	20	11.5

Risk Ratio

The risk ratio is calculated by dividing ERA values by the TOC value. A Risk Ratio approaching or greater than 1.00 serves as a "yellow flag" indicator of increasing susceptibility for significant adverse cumulative effects occurring within a watershed. Susceptibility of cumulative watershed effects generally increases from low to high as the level of land disturbing activities increase toward a risk ratio value of 1.00 (USFS 1988). Watersheds with a "yellow flag" rating of 1.00 are not necessarily in eminent danger of unacceptable cumulative watershed effects, but these watersheds contain enough disturbance to "warrant a closer look" (USDA 1996). It should be noted that the *ERA Methodology* analyzes watershed conditions regardless of land ownership.

The table below summarizes the risk ratio calculations by sub-watershed analysis area based on current conditions. These values are used as a baseline against which the Proposed Action is compared.

Table 19. Current Condition Risk Ratio Calculations by Watershed

	Palmer	Beaver	Star Gulch
Percent ERA	5.13%	4.62%	5.49%
TOC	10.5	11.5	11.5
Risk Ratio	**0.489**	**0.402**	**0.525**

The risk ratios for all three sub-watersheds are at levels that do not warrant concern at this time.

Proposed Action

The Proposed Action was evaluated by calculating the change in ERA values that would be a result by implementing each of the proposed activities. Coefficients are used to model changes in vegetation or land cover. These coefficients were developed by specialists on the Klamath NF and have been updated as a result of monitoring and review of projects. Coefficients are additive, in other words the coefficients for prescriptions are added to logging system coefficients, which are added to site preparation coefficients.

Table 20. ERA Project-Scale Coefficients

Roads		Prescription		Logging System		Site Prep – Fuels	
Miles X 4.77	12 m (40 feet) wide prism, slopes >35%	High disturbance	0.12	Tractor	0.12	Tractor pile	0.12
		Moderate disturbance	0.06	Tractor – modified	0.04	Tractor bunch	0.06
		Low disturbance	0.03	Cable	0.02	Hand pile	0.001
		None	0.00	Helicopter	0.001	Masticate	0.03
Miles X 2.39	6 m (20 feet) wide prism, slopes <35%			Roadside	0.01	Broadcast burn	0.05
				Feller-buncher	0.08	Jack-pot burn	0.025
						Underburn	0.02

NOTE: Coefficients from Elder & Laurent (April, 1998); modified from Jack/Gray EA (Kilgore & Power, 1998) and using relative values from KNF CWE Analysis Handbook (VandeWater, et al., 1990) & other literature sources. Modified by Elder/Laurent (Sept., 2000) for Dogbark Salvage TS and for Woodchopper Fire Recovery (October, 2001). Modified from CWE timber planners/resources meeting (February 20, 2002); Logging system coefficients modified for Horse Heli (December 10, 2002); Elder, Laurent, Power, et al. {Citations from KNF sources)

Based on these coefficients, the following example values were used to model the effects of the actions being proposed in the Upper Applegate Watershed Restoration Project. This table shows how the coefficients in Table 20 are combined for multiple activities.

Table 21. Examples of Calculated Coefficients by Fuel Reduction Activity

Activity	Coefficient
Density management (moderate disturbance), helicopter removal, activity fuels treatment	0.086
Density management (moderate disturbance), ground based removal, activity fuels treatment	0.205
Helicopter landing construction, road reconstruction	1.000
Ladder fuels treatments (low disturbance), hand pile and burn activity fuels	0.031
Group selection (high disturbance), helicopter removal, activity fuels treatment	0.122
Surface fuels treatment - hand pile and burn	0.001

Activity	Coefficient
Broadcast burn or underburn	0.050

Summary of Results

The following tables display the results of the analysis for each individual sub-watershed, for the current condition and the Proposed Action.

Table 22a. Palmer Creek Sub-watershed by Alternative

	Current Condition	Proposed Action
Total Acres	16,113	16,113
ERA	827	1264
%ERA	5.13%	7.85
TOC	10.5	10.5
Risk Ratio	**0.489**	**0.747**

Table 22b. Beaver Creek Sub-watershed by Alternative

	Current Condition	Proposed Action
Total Acres	18,682	18,682
ERA	864	1,257
%ERA	4.62%	6.73%
TOC	11.5	11.5
Risk Ratio	**0.402**	**0.585**

Table 22c. Star Gulch Creek Sub-watershed by Alternative

	Current Condition	Proposed Action
Total Acres	17,503	17,503
ERA	960	1,058
%ERA	5.49%	6.04%
TOC	11.5	11.5
Risk Ratio	**0.477**	**0.525**

None of the sub-watersheds show any substantial increase in the risk ratio associated with the Proposed Action. This is primarily due to the type and intensity of the proposed treatments under the Proposed Action. Treatments proposed are primarily "thinning from below" or prescribed burning and are of low to moderate disturbance. Relatively few acres of ground based harvest systems are proposed under the Proposed Action.

Reasonably Foreseeable Actions

Cumulative effects analysis requires that future actions that are reasonably foreseeable be examined along with the proposed action. For this analysis, a time period of 10 years was selected to examine future actions. This time period was selected because it is anticipated that this is the length of time that the Proposed Action would take to fully implement.

It is assumed that no other (reasonably foreseeable) fuels management on National Forest lands, other than that being proposed under UAWRP, for the next fifteen (15) years. Any proposed action beyond this timeframe would have to consider (presumably under a NEPA process) the current conditions at that time, created by actions at this time.

On federal lands, the only actions expected to occur already have NEPA decision documents and as such, have been assumed for modeling purposes to already have been implemented. These include projects such as the Upper Applegate Road Hazardous Fuels Reduction Project, various timber stand improvement activities, and stream restoration projects.

During the modeling of current condition, it was assumed that most of the lands outside the National Forest boundary have been subject to recent disturbance and as such, it anticipates and models future activities. Industrial forest lands within the Upper Applegate watershed may or may not be treated within the next 10 years. However, as mentioned before, this has been accounted for in the current condition modeling, by applying a disturbance coefficient that assumes treatment.

Summary of Results

The Equivalent Roaded Area model does not give a quantifiable number (output) for sedimentation, tons of soil eroded/detached, or any other similar item. This model does generate a percent ERA value that can be used to compare an action against the current condition. If the ERA for the watershed is below the threshold of concern, then the watershed is below the threshold and the cumulative effects of the Proposed Action is not anticipated to be a concern. If the ERA approaches the threshold of concern then cumulative effects may warrant a closer look.

Based on the analysis described for these sub-watersheds and the change that would result from implementation of UAWRP, it is not expected that the risk of adverse cumulative effects would be of concern. Areas outside of the Analysis Area would not likely be affected and as disturbed areas become recovered, watershed conditions would continue on an upward trend.

K. TERRESTRIAL WILDLIFE SPECIES AND HABITATS

Activities associated with restoration treatments and new trail development, along with other connected actions, may affect terrestrial wildlife species and habitats, including, Forest Service Sensitive species, Northwest Forest Plan Survey and Manage Species, Management Indicator Species, migratory birds, and pollinators.

Project effects to wildlife are evaluated by number of known sites affected, acres of impacts or changes to specific habitat(s), and extent, duration and timing of disturbance. The scale and methodology for evaluating effects differ by species based on their habitat requirements and the type of status they have. This section covers Forest Service Region 6 sensitive species, Northwest Forest Plan survey and manage species, Forest Service management indicator species, migratory birds, and pollinators.

Forest Service Region 6 Sensitive Species

Region 6 sensitive species are species the Regional Forester approves to meet obligations under the ESA, National Forest Management Act (NFMA), and Forest Service Policy that states we should ensure our actions do not contribute to a loss of viability or cause a trend towards listing of a species under the ESA. Generally, they are either species that are warranted for listing status but precluded by higher priority listings or proposed for listing. Additional information on regionally sensitive species can be found at the Interagency Special Status/Sensitive Species Program (ISSSSP) website at: http://www.fs.fed.us/r6/sfpnw/issssp/. The website contains

species fact sheets for many of the species and gives detailed life history and habitat needs for the species.

Table 23. Regionally Sensitive Wildlife Species Known To Occur or Whose Known Ranges Overlap the Upper Applegate Watershed

Species Common Name	Species documented in the action area	Habitat present in action area	District Occurrence	Habitat
Amphibians and Reptiles				
Foothill yellow-legged frog	Yes	Yes	GBRD WRRD SMRD HCRD	Partially shaded, rocky streams at low to moderate elevations in areas of chaparral, open woodland, and forest. (http://explorer.natureserve.org/)
Black Salamander	Yes	Yes	SMRD	Conifer, hardwood, or mixed conifer forests. Burrow using soil or fallen log debris. Prefer moist woodlands along streams and seepages. (http://explorer.natureserve.org/) SMRD
Siskiyou Mountains salamander	Yes	Yes	SMRD	Highly associated with rocky talus slopes in areas of dense mature and late-seral forest. (http://explorer.natureserve.org/) 1 entry on the Gold Beach/Wild Rivers boundary and several entries about 47 km EES of GBRD over on the Siskiyou Mountains RD—NRIS
Western pond turtle	Yes	Yes	GBRD WRRD SMRD HCRD	Permanent and intermittent waters of rivers, creeks, small lakes and ponds, marshes, unlined irrigation canals, and reservoirs. Often basks on logs, vegetation mats, or rocks. (http://explorer.natureserve.org/)
Birds				
American peregrine falcon	Yes	Yes	GBRD WRRD SMRD HCRD	Open country, cliffs, and sometimes cities. Often found near water, especially along coast. (Audubon - Guide to North American Birds, www.audubon.org/field-guide/bird/peregrine-falcon).
Bald eagle	Yes	Yes	GBRD WRRD SMRD HCRD	Coasts, rivers, large lakes. Typically close to water, also locally in open dry country. Occurs in wide variety of waterside settings where prey is abundant. (Audubon - Guide to North American Birds. (www.audubon.org/field-guide/bird/bald-eagle).
Lewis's woodpecker	Yes	Yes	GBRD WRRD SMRD HCRD	Scattered or logged forest, rover groves, burns, foothills. Needs open country with large trees for nest sites and foraging perches (Audubon - Guide to North American Birds, www.audubon.org/field-guide/bird/lewiss-woodpecker)
Insects				
Western bumblebee	No	Yes	GBRD WRRD SMRD HCRD	Generalist pollinators. Stream courses, meadows, recently burned or logged areas or on flowers by roadsides. (USDAFS and Pollinator Partnership, Guide to Bumble Bees of the Western US)

Species Common Name	Species documented in the action area	Habitat present in action area	District Occurrence	Habitat
Franklin's bumblebee	No	Yes	SMRD HCRD	Only known from southern OR and northern CA between the Coast and Sierra-Cascade Ranges. Douglas, Jackson, and Josephine Co. in OR. HCRD
Coronis fritillary	No	Yes	GBRD WRRD SMRD HCRD	Siskiyou Mountains in OR. Josephine and Jackson Counties. Expected in Curry, Coos, and Douglas Counties. Mountain slopes, foothills, dry gulches, lower elevation canyons, prairie valleys, meadows, chaparral, sage steppe, and forest glades, margins, and openings. Often congregate on hillsides and meadows overgrown with rabbit-brush and sage. Generally associated with serpentine influenced, rocky hill-slopes dominated by Jeffery Pine. Larvae feed strictly on violets. (USDA FS Species Fact Sheet)
Gray-blue butterfly	Yes	Yes	SMRD HCRD	Found in Southern Cascades and Eastern Siskiyou mountains in Douglas, Jackson, and Klamath counties.
Johnson's hairstreak	No	Yes	GBRD WRRD SMRD HCRD	Host plant: Conifer mistletoes occurring mainly on western hemlock and occasionally true firs. Nectar including Oregon grape, pacific dogwood, ceanothus, pussy paws, and Rubus spp. And visit mud. Late Feb to early Sept. Old Growth obligate and late successional. Spend most time in forest canopy. (http://www.xerces.org/johnsons-hairstreak/)
Mardon skipper	No	Yes	GBRD HCRD	Prairie and meadow habitat with abundant ID fescue. Short, open stature of native fescue bunchgrass stands allow Mardon skippers to readily access both nectar and oviposition plants. Larvae feed on fescues and adults nectar from a variety of plants strongly preferring blue violet. (http://www.xerces.org/mardon-skipper/)
Siskiyou short-horned grasshopper	Yes	Yes	SMRD HCRD	Southern OR near CA border and Benton County. Type locality in Jackson Country OR. Clear cuts and naturally formed grassy meadows often bordered by fir and less often pine forests. Elderberry is thought to be the preferred plant host for females to lay eggs. (USDA FS Species Fact Sheet)
Mammals				
Pacific fisher	Yes	Yes	GBRD WRRD SMRD HCRD	Occurring only at mid- to lower elevations in mature conifer and mixed conifer/hardwood forests characterized by dense canopies and abundant large trees, snags, and logs (Powell and Zielinski 1994).

Species Common Name	Species documented in the action area	Habitat present in action area	District Occurrence	Habitat
Fringed myotis	No	Yes	GBRD WRRD SMRD HCRD	Riparian, grassland, and woodland habitats. Roosts in caves or mines, cliff faces and, snags, and other sheltered sites. Snag obligate in SW Oregon. (http://explorer.natureserve.org/)
Townsend's big-eared	Yes	Yes	GBRD WRRD SMRD HCRD	Found regularly in forested regions and buildings and in areas with a mosaic of woodland, grassland, and/or shrub land. Maternity and hibernation colonies typically are in caves and mine tunnels. Prefer relatively cold places for hibernation, often near entrances and in well-ventilated areas. (http://explorer.natureserve.org/)
Pallid bat	No	Yes	GBRD WRRD SMRD HCRD	Mountainous areas, inter-montane basins often near rocky outcrops and water. Also inhabits open coniferous forest and woodland. Day roosts include crevices of rock outcrops, caves, mine tunnels, buildings, bridges, and hollows of live and dead trees. Documented using snags, bridges and bat boxes in SW OR as maternity sites. (http://explorer.natureserve.org/)
Mollusks				
Oregon shoulderband	Yes	Yes	SMRD	Jackson, Josephine, and Douglas Counties.
Siskiyou hesperian	Yes	Yes	WRRD SMRD HCRD	Upper Klamath Lake, Crater Lake NP, and the Klamath River drainage on the RRS.
Travelling sideband	Yes	Yes	SMRD	Jackson County
District Occurrence: SMRD = Siskiyou Mountains Ranger District; WRRD = Wild Rivers Ranger District; HCRD = High Cascades Ranger District; GBRD = Gold Beach Ranger District				

Potential Effects to Region 6 sensitive species are summarized in Table 24.

Table 24. Summary of Effects to Region 6 Sensitive Species.

Common Name	Proposed Action
Siskiyou Mountains salamander	Potential ground disturbance to habitats and potentially some disturbance within some High Priority sites. Per the SC, all recommendations for treatments within salamander HP sites and all habitat would be followed
Pacific fisher	Incidental loss of snags or potential disturbance of individuals from project activities and danger tree mitigation. Potential disturbance from activities during the breeding season
Lewis' woodpecker	Incidental loss of snags or potential disturbance of individuals from project activities and danger tree mitigation. Potential disturbance from activities during the breeding season

Common Name	Proposed Action
Oregon shoulderband & Travelling sideband	Oregon shoulderband and Travelling sideband unlikely common in any watershed. Any treatments in moist, rocky habitat with mixed conifer-hardwood overstory could disturb or harm habitat or individuals, especially in warm, wet weather. Required surveys are ongoing and any sites would be protected
Franklin's & Western bumble bees	Franklin's is an unlikely inhabitant in any watershed, Treatments that increase understory sunlight and flowering plant diversity would provide more nectar and pollen. Ground disturbing activities could harm individuals, nests or cause short-term loss of forage.
Fringed myotis. Pallid bat	Incidental loss of snags or potential disturbance of individuals from project activities and danger tree mitigation. Potential disturbance from activities during the breeding season

Siskiyou mountains salamander - Thinning and prescribed fire in unmanaged stands has the potential to impact this species. However, there are modeled high priority sites as well as habitat that would be managed per the Conservation Strategy. Implementation of the Proposed Action May Impact Individuals and or Habitat, but not likely contribute towards a trend to federal listing or a loss of viability to the population or species for both the Siskiyou mountains salamander and the black salamander due to potential disturbance to individuals from treatments.

Pacific fisher - Primary effects to the fisher would come from cutting danger trees, noise from operations, hauling, and activity fuel burning. Fisher are associated with late successional habitat with high canopy cover and decadence components (snags, large down wood). Danger tree felling could reduce large snags, some of which would be left for down wood and some would be removed. Seasonal restrictions to avoid disturbance to spotted owls would also benefit fishers and martens during the breeding season, but they would likely avoid habitat directly involved with project activities during implementation.

The proposed action would treat up to 306 acres of late-successional habitat (NSO NRF) which is high quality habitat for fisher. It would also impact up to 462 acres of mid-aged unmanaged stands that may also be important for fisher, especially if they contain black oak or other hardwoods and are on southeast to southwest aspects that fisher are known to use as den sites. Recent radio telemetry work in the Ashland watershed shows that fisher would continue to use treated NRF habitat and mid-aged stands post treatment if they maintain at least 60 percent canopy and maintain other structures such as hardwoods, down wood and large trees with mistletoe brooms for rest sites (Clayton Pers. Obs.). In fact, in the Ashland watershed at least six dens were used in units post treatment (Clayton Pers Obs). However, it was also shown that fisher tended to avoid areas with less than 60% canopy cover. Approximately 120 acres of NRF in unit 51 would be downgraded and therefore not likely to be available to fisher in the short term. However it is important to maintain and even release live hardwoods in particular black oak in order to maintain that denning habitat on the landscape. In addition, black oak and other hardwood snag were also used to a great extent so every effort should be made to maintain them within all units. Thinning of unmanaged stands and prescribed fire within suitable denning habitat would be restricted to outside of the denning season, March 1 to June 1.

Proposed new trails that occur within suitable habitats for fisher could impact them somewhat, however in Ashland eight fisher dens were located within 100 meter of open well-travelled roads and trails. In that case the animals may have been somewhat habituated to the disturbance. New trails, in particular the motorized trails may cause some avoidance effect by fisher in the short term.

Implementation of the Proposed Action May Impact Individuals and or Habitat, but not likely contribute towards a trend to federal listing or a loss of viability to the population or species for Pacific fisher or Pacific marten (coastal population) due to potential disturbance to individuals and limited loss of habitat from treatments.

Lewis' woodpecker - Direct and indirect would be from cutting danger trees, noise from operations, hauling, and activity fuels burning. Felling of snags for danger tree mitigation may reduce snags suitable for these species. Disturbance restrictions for spotted owls would benefit these woodpeckers in the breeding season.

Implementation of the Proposed Action May Impact Individuals and or Habitat, but not likely contribute towards a trend to federal listing or a loss of viability to the population or species for Lewis's woodpecker or the white-headed woodpecker due to potential disturbance to individuals during treatments and minimal adverse effects to habitat from loss of snags for danger tree mitigation.

Oregon shoulderband, travelling sideband - Potential impacts for these low-mobility species may include mortality from tree felling and equipment operation. Large down wood, large hardwoods and rocky areas would be retained and avoided to the extent possible, but some incidental loss or disturbance of these habitats may occur. No-treat protection buffers on riparian areas would protect some potential habitat and any individuals that may occur there. Treatments that increase hardwood growth and diversity and development of late successional habitat structure would benefit these species. Surveys are currently ongoing in all unmanaged stand that would be mechanically thinned within the proposed action area. Any site that are found would be protected. Survey are not required for trails that do not exceed 5 acres in found disturbance per the Survey and Manage direction. New proposed trails would not be surveyed.

Incidental danger tree felling may provide down wood habitat where site conditions are suitable with cover and moisture. Direct mortality could occur from pile burning.

Implementation of the Proposed Action May Impact Individuals and or Habitat, but not likely contribute towards a trend to federal listing or a loss of viability to the population or species for the Oregon shoulderband or travelling sideband due to potential loss of individuals during treatments and minimal adverse effects to habitat from loss down wood habitat. The travelling sideband is more likely to be affected because it is widely present in the Upper Applegate watershed, whereas the Oregon shoulderband is less likely to occur in project units.

Franklin's and western bumble bees - These species are rare, however there is suitable habitat in the Upper Applegate watershed, though not within the roadside buffer areas. Western bumble bees have been documented recently (2016) near Mt Ashland. Ground disturbing activities such as equipment operation and yarding during the spring, early summer or early fall could cause direct mortality of individuals or destroy bumble bee nests. However, rare plant restoration, pine and oak and other hardwood restoration activities may benefit these species. Mitigations specific to this group of species is to conduct activities outside of the spring breeding and nesting period.

Implementation of the Proposed Action May Impact Individuals and or Habitat, but not likely contribute towards a trend to federal listing or a loss of viability to the population or species for the western bumble bee or Franklin's bumble bee due to potential loss of individuals or nests during treatment activities, though they are rare throughout their range.

Pallid Bat and Fringed myotis - Cutting of danger trees which are large snags in early stages of decay that may provide roost sites may cause incidental disturbance of individual bats during project activities and loss of roosts. All known roosts would be protected from disturbance during the appropriate seasons.

Implementation of the PA May Impact Individuals and or Habitat, but not likely contribute towards a trend to federal listing or a loss of viability to the population or species for the fringed myotis due to potential disturbance of individuals or loss of a small number of large snags from danger tree felling. Known maternity roosts would not be disturbed during the maternity season.

Northwest Forest Plan Survey and Manage Species

Great Gray Owl - The great gray owl occupies boreal, montane and subalpine forests of the western United States. Prey items are primarily small rodents including pocket gophers and voles for which they hunt from perches near large open grassy and woodland areas. They do not build nests and use old hawk and raven stick nests, depressions on broken top snags or stumps, and platforms formed by dwarf mistletoe. Nest sites tend to be located in mature or remnant old-growth forests near large meadow opening with sufficient prey.

The great gray owl is currently a category A species on the December 2003 survey and manage list. Category A species require pre-disturbance surveys and management of known sites. All of the Upper Applegate watershed has been surveyed and there is one known site.

Chase Sideband - The survey protocol used for the Chase Sideband was the Survey Protocol for Survey and Manage Terrestrial Mollusk Species from the Northwest Forest Plan version 3.0, 2003. This protocol includes detailed natural history and habitat descriptions and is available at https://www.blm.gov/or/plans/surveyandmanage/protocols/ and a species fact sheet available in the project record. Key information is summarized below.

The Chase sideband is currently a category B species on the December 2003 survey and manage list. Category B mollusk species require equivalent-effort surveys and protection of known sites.

This species is endemic to northern California and southwest Oregon. In California, this species has been reported mainly from the Klamath Basin in northern Siskiyou County, from the vicinity of Happy Camp east to the Shasta and Little Shasta River Drainages, in the Goosenest Ranger District of the Klamath National Forest, with a few locations reported as far south and west as Trinity County, on the eastern slopes of the Trinity Mountains in the Weaverville Ranger District of Shasta-Trinity National Forest. In Oregon, sites occur in southern and eastern Jackson and Douglas Counties, in the Klamath-Siskiyou Mountains and the west slopes of the Cascades, north to the Umpqua River basin. One site has been reported from the Klamath River Basin in southwestern Klamath County, Oregon. This species has not been documented in Josephine County.

Chace sidebands are associated with forested and open talus or rocky areas. Vegetation types include dry conifer and mixed conifer/hardwood forest communities as well as oak communities. Mollusks which inhabit rocky habitats also utilize the surrounding forest areas for foraging and dispersal during moist, cool conditions.

Seasonal deep refugia include talus deposits and outcrops, which contain stable interstitial spaces large enough for snails to enter. These seasonal refugia also provide protection from fire and predation during inactive periods. Within rocky habitat, the species is also associated with subsurface water, herbaceous vegetation and deciduous leaf litter. In some forested sites, especially in the Oregon Cascades Province, the species has been found associated with down wood where few rock substrates occur. Areas with frequent fire return intervals where rock crevice refugia are available may have historically favored this species over other, larger forms of Monadenia.

The Upper Applegate watershed contains suitable habitat for chase sidebands and surveys are ongoing.

Management Indicator Species

The National Forest Management Act of 1976 (NFMA) requires that each national forest identify management indicator species (MIS) in the planning process and that "fish and wildlife habitats would be managed to maintain and improve habitat of selected management indicator species." By monitoring the habitat changes or trends of these particular indicator species, the effects of management activities on the associated animal communities can theoretically be determined.

Table 25. Management indicator species for the Rogue River National Forests.

Species	Habitat Represented	Why Selected
Northern spotted owl	Old-growth forest	Endangered/Threatened
Pileated woodpecker, American marten	Mature forest	Represents Specific Habitat
Woodpeckers	Snags (standing dead trees)	Represents Specific Habitat
Black-tailed deer, Roosevelt elk	Early successional forest stages	Species Commonly Hunted

Spotted Owl, Pileated Woodpecker, and American marten - The northern spotted owl was selected as a MIS species because it is a federally listed Threatened species. The Northern spotted owl represents over 150 other wildlife species which use old-growth forest habitat for all or part of their life cycles. The combined habitat networks for spotted owl, and pileated woodpecker, along with intertwined Riparian areas, serve as an interlocking habitat system for all wildlife species which use mature and old-growth forest. Overall, late succession habitat in 2017, totaled 538,953 acres (20+ inches DBH) across the Forest. This habitat is considered to be nesting roosting, and foraging for spotted owls. For a full discussion of spotted owls and the effects of the Proposed Action see the discussion on Threatened and Endangered Wildlife Species.

In 2017 over 300,000 acres (15 percent) of the forest burned at varying intensities. There were three large complexes and several other smaller fires that burned across the forest, the Chetco Bar Fire (191,084 acres), the Miller Complex (39,000 acres), and the High Cascades Complex (76,766 acres) were the largest of these fires. Overall, there was a rather small change in the habitat baselines for late-successional habitat associates on the Forest, the northern spotted owl, marten, and pileated woodpecker. Across the Forest within affected watersheds, there was an overall loss of late-successional habitats of approximately 19,000 acres.

Primary Cavity Nesters - For the RRNF, primary cavity excavators are the hairy and downy woodpeckers and the northern flicker. They were chosen to represent all wildlife species which use cavities for nesting or denning.

The amount of forest in an unmanaged condition and providing snags at background levels has declined on both the Rogue River and Siskiyou National Forests. As of 2011, there was far more habitat available and more habitat within reserve land allocations for woodpeckers than was planned for in the original LRMPs. It was anticipated that there was a high likelihood that the forests were providing habitat for far more woodpecker pairs than originally thought to be needed to provide for long term viability for this species. The Biscuit Fire burned through 467,702 acres within the SNF and provides areas with high snag amounts. Fires have increased snag habitat across the forest by approximately 45,000 acres and low severity fire has also somewhat increased potential snag habitat across the forest.

Black-tailed Deer and Roosevelt Elk - Deer and elk represent over 180 other wildlife species needing young successional stages to meet all or some of their life history requirements. Elk do not occupy a large part of the Upper Applegate watershed so black tailed deer are used as that MIS species.

Specifically, on the RRNF, forage habitat for elk and deer is the primary limiting factor on the Forest, constituting less than ten percent of the Forest land base. The west side of the Forest provides good forage in designated big game winter range for black-tail deer (there are very few if any elk on the west side of the Forest) due to a preponderance of low elevation non-conifer forest lands and an active fuels and habitat enhancement program (over 5,500 acres of big game winter range on the Siskiyou mountains RD have been treated in the last 5 years). However, the Cascade portion of the Forest, due to different forest types and management activities, is depauparate in the amount of forage habitat available elk and deer. Elk and deer thermal and hiding cover have increased substantially across the Forest although in some areas of big game winter range still not to that amount prescribed in the original LRMP. Refer to the issue discussion regarding Big Game Winter Range.

Migratory Birds

Focal bird species, which represent important habitat components in a functioning coniferous forest ecosystem, are used in our analysis on migratory birds. The concept is described in detail in Habitat Conservation for Landbirds in the Coniferous Forests of Western Oregon and Washington (Altman and Alexander 2012). In addition, Partners in Flight (PIF) published a revised Landbird Conservation Plan for Canada and the Continental United States in 2017. This plan identifies additional species for BCR 5 of high conservation concern and common species in steep decline for which proactive management of habitat and reduction of threats are expected to reverse population declines. According to the PIF species list, there are 156 birds that could occur within the watersheds associated with this project. For purposes of efficiency, a subset of the full list is shown in Table 26. These species were chosen to represent all species that require specific habitat attributes within the various forest conditions that would occur within the Upper Applegate watershed.

Table 26. Migratory bird species of concern and associated habitat attributes within the UAW Upper Applegate watershed.

Forest Condition	Habitat Attribute	Focal Species
Old-growth/Mature	Large snags	Pileated Woodpecker
Old-growth/Mature	Large trees	Brown Creeper
Old-Growth/Mature	Deciduous canopy trees	Pacific-slope Flycatcher
Old Growth-Mature	Mid-story tree layers	Varied Thrush
Mature	Conifer-deciduous canopy	Northern goshawk
Mature	Large patches of moist conifer forest	Chestnut-backed chickadee
Mature/Young	Closed canopy	Hermit/Townsend's Warbler
Mature/Young	Open mid-story	Hammond's Flycatcher

Forest Condition	Habitat Attribute	Focal Species
Mature/Young	Deciduous understory	Wilson's Warbler
Mature/Young	Forest floor complexity	Pacific Wren
Young/Pole	Deciduous canopy trees	Black-throated Gray Warbler
Young/Shrub	Open shrub dominated	Mountain quail
Young/Shrub	Dense brush/young plantations	Wrentit
Sapling/Seedling	Residual canopy trees	Olive-sided Flycatcher
Sapling/Seedling	Snags	Northern Flicker
Sapling/Seedling	Deciduous vegetation	Orange-crowned Warbler
Unique	Alpine grasslands	American Pipit
Unique	Nectar-producing plants	Rufous Hummingbird
Unique	Mineral springs/seeps	Band-tailed Pigeon
Unique	Montane wet meadows	Lincoln's Sparrow
Unique	Large hollow snags	Vaux's Swift
Unique	Landscape mosaic forest	Blue (Sooty) Grouse
Klamath Mts. Mixed Forest	Pine-oak canopy/subcanopy trees	Purple Finch
Klamath Mts. Mixed Forest	Dense shrub understory	Nashville Warbler
Klamath Mts. Mixed Forest	Shrub-herbaceous interspersion	Hermit Thrush
Klamath Mts. Mixed Forest	Forest canopy edges	Western Tanager
Klamath Mts. Mixed Forest	Montane brushfields	Fox Sparrow
Klamath Mts. Mixed Forest	Post-fire	Lazuli Bunting
Conifer Hardwood Forest	Mixed conifer and hardwoods	Pine siskin
Conifer Forest Edge	Forest edge/shrub openings	Evening grosbeak
Forest Edge/Riparian	Dense, moist vegetation	Allen's hummingbird
Edge/Riparian	Dense riparian shrubs (willow)	Willow Flycatcher

Effects to migratory birds are considered by habitat attributes similar to MIS species but at a finer scale. Effects to these attributes based on treatment types and mechanisms of effects are described below. There would be no effects to migratory birds under the current condition. Current habitat distribution would remain and natural processes such as vegetation encroachment and wildland fire would alter habitat over time.

All treatments have potential to disturb active bird nests during the breeding season which could cause failed reproduction or mortality of young, though seasonal restrictions for spotted owls would also provide protection for other nesting birds. To the extent possible, any active bird nests encountered during project activities would be given a no-treat buffer adequate to avoid a stress response (e.g., flushing an adult from incubating eggs or nestlings, avoid feeding young, or defensive behavior) or mortality until young have fledged. Otherwise, adult birds and fledglings would likely avoid an area during activities until disturbances such as noise and smoke end. For all treatments, noise and smoke disturbance may cause short-term avoidance outside of habitat which may be cumulative with any concurrent treatment of adjacent plantations resulting in a larger area avoided. Proposed road closure and decommissioning would locally reduce impacts of human disturbance and benefit birds that use those areas.

Recreation routes have been shown to affect forest birds. For example, roads may result in the loss or fragmentation of habitat for brown creepers. Hutto (1995) found that brown creepers were twice as likely to occur in habitats that were more than 100 m from a road, and both Keller and Anderson (1992) and Brand and George (2001) found that brown creepers were associated with larger forest patches. Foppen and Reijnen (1994) found that roads and motorized trails reduced forest bird reproduction up to a distance of 200 m.

In addition, roads and recreation trails may break up forest patches and increase nest predation and parasitism rates by species such as cowbirds (Molothrus spp.) (Hickman 1990, Miller et al. 1998). Gutzwiller et al. (2002) found that human intrusion, in the form of hiking, increased the probability of gray jay (Perisoreus canadensis) recurrence, which may increase nest predation on other bird species. Trails used for hiking also can influence forest bird habitat use. Miller et al. (1998) reported a zone of influence of 100 m for some forest bird species and somewhat larger if dogs are also on trails unleashed (Gaines et al. 2003).

However, rare plant restoration, pine and oak and other hardwood restoration activities may benefit those species that favor more open and hardwood dominated habitat types. Mitigations specific to this group of species is to conduct activities outside or the spring breeding and nesting period.

Pollinators

In June of 2014 a Presidential Memorandum was issued to create a Federal strategy to promote the health of honey bees and other pollinators. Federal agencies were tasked with enhancing pollinator habitat on their managed lands, consistent with their mission and public safety. Best management practices for enhancing pollinator habitats have been developed (Xerces Society for Invertebrate Conservation 2015) and would be implemented within the UAW Upper Applegate watershed, where practical.

Habitat for pollinators is varied within the watershed depending on habitat conditions. The best pollinator habitat consists of open landscapes with good sun exposure and many types of native, herbaceous plants (Xerces Society for Invertebrate Conservation 2015). Native forbs are available in smaller amounts, mostly along roadsides and riparian areas. The meadows tend to have more grasses than forbs. Depending on the pollinator species present, other important components are dead wood, open soil for nest sites, and open water.

All proposed treatments under the Proposed Action could result in short-term loss of nectar and pollen due to ground and vegetation disturbance (e.g., brush cutting, burning) near roadside cutting areas, and long-term increases in nectar and pollen production with increased sunlight, reduced competition, and in some cases, rejuvenation from thinning and burning activities. However, rare plant restoration, pine and oak and other hardwood restoration activities may benefit these species. Mitigations specific to this group of species is to conduct activities outside or the spring breeding and nesting period.

Other actions such as Upper Applegate Road Hazardous Fuels Reduction Project may also contribute to cumulative effects to pollinators, however those actions would also likely open up habitats for these species that may beneficial. Implementation of the Proposed Action **May Impact Individuals and or Habitat**, but not likely contribute towards a trend to federal listing or a loss of viability to the population or species for pollinators due to potential disturbance of individuals or loss of some habitats in the short term for these species

L. BIG GAME WINTER RANGE

Activities associated with restoration treatments and new trail development, along with other connected actions, may affect Big Game Winter Range, in particular thermal and hiding cover.

Black-tailed deer use all successional stages to meet their habitat needs for cover, forage and reproduction. Natural or created openings provide the majority of foraging habitat, which is assumed to be the most restrictive habitat component in this region (Forest Plan FEIS, III-106-107). Forage habitat is available within existing meadows, harvest units and burned areas less than ten years old, and open canopy forested areas.

Forest Service and Oregon Department of Fish and Wildlife (ODFW) estimates of habitat capability vary however, both methods resulted in a proposed cover/forage ratio of 80:20 for the Rogue River National Forest. Prior to implementation of the NWFP, regeneration harvests provided high-quality forage areas for big-game adjacent to both thermal and optimal thermal stands. Natural succession allowed for the forb and shrub layers to propagate at high-densities throughout the harvest unit for a period of 5-10 years or more until seedlings over-topped and shaded out the forage species. Currently, silvicultural prescriptions in young commercial stands typically reduce the canopy cover to near 40%, which maintains dispersal habitat for spotted owls. Reducing canopy cover to near 40% provides openings and allows sunlight to reach the forest floor which can stimulate growth of herbaceous and shrub layers. This can provide a short-term (5-10 year) increase in the forage base for deer until canopy of the remaining trees once again shade out the understory growth. The same prescription reduces thermal cover for big-game if the stand was at ≥70% canopy cover prior to harvest. It may also reduce hiding cover for a period of time until the shrub layer reaches 3-5 feet in height (USDA Forest Service 2012).

For Management Area 14, the Forest Plan requires Big-Game Winter Range (BGWR) habitat to provide a minimum of 50 percent thermal cover on each 500 to 1,000 acre analysis area. At least two-thirds of the thermal cover (30 percent of the analysis area) should meet optimal thermal cover requirements (USDA Forest Service 1990b, page 4-166). Thermal cover is defined as cover used by (big game) animals to lessen the effects of weather, typically a stand of coniferous trees 40+ feet tall with an average crown closure of 70 percent or greater. Optimal thermal cover includes these parameters as well as an average stand diameter of 21+ inches DBH (USDA Forest Service 1990b).

In other allocations associated with the Upper Applegate watershed, standards and guidelines are to maintain summer range to provide 20 percent forage, and at least 20 percent thermal cover for an area generally 500 to 1,000 acres. To the extent possible, timber harvesting and/or thinning should provide hiding and thermal cover between treatment areas and roads with continuous vehicle use. Hiding cover should be dense enough to hide 90 percent of a deer or elk from view at 200 feet. Hiding cover need not be continuous but gaps between screens should not exceed one-quarter of a mile. A restricted operating period from April 1 to June 30 may be imposed in identified deer or elk fawning or calving areas (USDA Forest Service 1990b, page 4-240).

To facilitate cover analysis, the District has developed a winter range block system to track thermal cover over time. Because the Rogue River Forest Plan requires tracking of 500 to 1,000 acre blocks, the basis utilized for these winter range blocks is a section (approximately 640 acres). Where winter range does not include the entire section, these portions of the winter range were added to winter range in an adjacent section, as long as they do not exceed 1,000 acres.

Winter range blocks may be entirely or partially within the project planning area. Thermal cover values are managed within the assigned winter range block and not by individual project or planning area boundary so they can be tracked through time. Current conditions in the UWA BRWR management land allocation are shown in the table below:

Table 27. Big-Game Winter Range thermal cover values

stage		1	2	3	4	5	6	7	8	9	10	11	12	total
early seral	forage	53	8	19	60	128	63	88	140	90	24	73	101	846
Farm Developed	forage	39	8	1	11	17	14	77	3	25	12	24	55	285
Mature > 20 inches >60 %cc'	Optimal thermal cover	103	106	45	7	3	71	141	8	25	158	137	15	818
Mature > 20 inches 40-60 %cc	hiding/ forage	2	3	4	5	28	10	28	33	8	3	16	30	1,71
Mature > 20 inches < 40%cc'	hiding/ forage	20	3	1	15	54	19	74	84	69	13	55	56	463
Seed Sapling Pole < 40% CC'	hiding/ forage	24	4	7	11	19	29	44	29	13	9	45	31	265
Seed Sapling Pole > 40% CC	hiding/ forage	161	169	157	138	125	167	89	68	118	183	125	39	1,539
Young 11-19 inch < 40%	hiding/ forage	22	4	3	1	4	12	40	8	26	17	26	14	178
Young 11-19 Inches CC >70%'	thermal cover	121	201	217	89	122	142	127	86	147	232	175	47	1,705
Young 11-19 Inches CC40% to 70%'	hiding/ forage	98	61	137	206	279	275	264	248	197	136	321	162	2,384

As can be seen in the table above, all winter range blocks within the UAWRP planning area are already below Rogue River LRMP standards and guidelines for Big-Game Winter Range thermal cover. Under the proposed action, thinning treatments would reduce canopy that contributes to thermal cover for 5-15 years approximately 150 acres (5%) of thermal cover habitat across all BGWR blocks within the Upper Applegate watershed. 41 acres of thinning would reduce canopy in optimum thermal cover for the same approximate period. Al of these acres fall within Management Area 14, Big-Game Winter Range. Hiding cover would not be appreciably reduced and forage is expected to increase.

All activities within Big-Game Winter Range including felling, yarding, road construction, road haul, and prescribed fire are subject to a restriction from December 1 to April 30 unless a specific waiver is authorized by the District Ranger.

Under burning treatments in both natural and activity fuels reduction units could reduce small woody material allowing room for forage plants to grow. This would provide additional forage benefits for big game. Fuels treatments would be designed to retain the majority of hiding cover within both winter range and summer range. However, fuels prescriptions may reduce hiding cover on some acres. In general, fuels treatments would benefit big game by increasing forage.

Pre-commercial thinning, and fuels treatments in the project Upper Applegate watershed would increase the forage component in many stands for big game for 5 to 15 years. These same treatments could slightly reduce hiding cover over the same acres and over the same time period.

Temporary roads and/or road reconstruction proposed under all alternatives would likely result in increased disturbance and vulnerability for big game while the roads remain open. Decommissioning would alleviate these effects within an estimated two decades. Road decommissioning would also help to reduce disturbance and vulnerability.

Trail decommissioning will have a positive effect by reducing disturbance to deer during the winter in big game winter range. Approximately 0.75 miles of the southern end of the proposed motorized Cinnabar trail and the Hanley Gulch trail are within BGRW and will be subject to seasonal restrictions for use from November 1 through April 30, per the RRNF LRMP (RRNF 1990)

Commercial timber harvest, pre-commercial thinning, fuels treatments, and in particular the plant restoration, and pollinator proposals, in the UAW project planning area would increase the forage component in many stands for big game for 5 to 15 years. These same treatments would reduce hiding cover over the same acres and over the same time period. All action alternatives would maintain minimum thermal cover standards required by the Rogue River Forest Plan. Temporary roads and/or road reconstruction proposed under the proposed action would likely result in increased disturbance and vulnerability to big game while the roads remain open. Decommissioning would alleviate these effects within an estimated two decades. Trail decommissioning would also help to reduce disturbance and vulnerability. Based on these factors the overall direct, indirect, and cumulative effects would result in a positive trend of habitat by increasing forage in the project Upper Applegate watershed. Therefore, the Proposed Action for the UAWRP would not contribute to an adverse trend in viability on the Rogue River National Forest for black-tailed deer and are consistent with the Forest Plan, and thus continued viability of black-tailed deer is expected on the Rogue River portion of the Rogue River-Siskiyou National Forest.

Past, present, and reasonably foreseeable future actions was reviewed to determine potential effects to black-tailed deer. The only action which would contribute to potential cumulative effects is the Upper Applegate Road (UAR) fuels reduction project because the effects may overlap in time and space.

This project was designed to maintain forest health and habitat diversity, reduce the risk of insect and disease infestations, reduce fuel loading and the effects of wildfire, and increase the quality of upland early seral and riparian vegetation. This project is largely beneficial to black tailed deer.

M. THREATENED AND ENDANGERED WILDLIFE SPECIES

Activities associated with restoration treatments and new trail development, along with other connected actions, may directly or indirectly affect Threatened or Endangered terrestrial wildlife species and/or Critical Habitat.

During development of this proposed project, the Rogue River-Siskiyou National Forest (RR-SNF) began early conversations with the U. S. Fish and Wildlife Service (USFWS) on potential effects to federally listed wildlife species. The USFWS and RR-SNF wildlife biologists visited the area on September 28th 2018.

The Forest Service is conducting formal consultation with the Fish and Wildlife Service. All activities will be implemented consistent with project descriptions and mandatory project design criteria (PDCs) identified in the final biological assessment and the Service's corresponding biological opinion.

Four species listed under the Endangered Species Act are known to occur on the RR-SNF: marbled murrelet (threatened), northern spotted owl (threatened), gray wolf (endangered) and Oregon spotted frog (threatened).

Gray wolf would not be affected by proposed activities, so they are not analyzed further. Wolves have not been documented, nor are suspected, on the Siskiyou Mountains Ranger District. The nearest documented occurrences are over 50 miles east in the Southern Cascades.

Oregon spotted frog would not be affected by proposed activities so they are not analyzed further. These frogs have not been documented, nor are suspected in the Upper Applegate watershed. Nearest known occurrences are over 50 miles east in the Southern Cascades.

Marbled murrelet would not be affected. The project is not within occupied habitat or critical habitat for the marbled murrelet. The project overlaps a portion of survey zones C and D for which surveys are not required due to the low likelihood of murrelet presence in these zones and any impacts to murrelet in these two zones are considered negligible. (USFWS 2002, letter to RR-SNF and Medford BLM, and USFWS 2002 Technical Assistance on the Final Results of Landscape-level Surveys for Marbled Murrelet in Southwest Oregon [FWS reference: 1-7-02-TA-6401]).

Relevant background information for the northern spotted owl is summarized here.

> **Legal status** - The northern spotted owl was listed as threatened in1990 due to widespread loss and modification of suitable nesting habitat (USDI Fish and Wildlife Service 1990).
>
> **Critical habitat** – About 50% of the UAW watershed is with within critical habitat units (CHU) KLW 4 and KLE-6. Additional details of this CHU and the full designation of critical habitat can be found in Federal Register notice Vol. 77, No. 233 at http://www.gpo.gov/fdsys/pkg/FR-2012-12- 04/pdf/2012-28714.pdf.
>
> **Threats** – The Upper Applegate watershed is entirely within the Oregon Klamath Province. Although the historic fire regime is believed to have benefitted spotted owls, uncharacteristically severe wildfire is considered the greatest current threat to owl habitat in the Klamath Province.

According to the 2011 NSO Recovery Plan Appendix B, the Oregon Klamath Province experienced the greatest amount of habitat loss on federal lands of all provinces between 1996 and 2006 due to wildland fire (93,600 acres) much of this was in the 2002 Biscuit Fire which burned in watersheds adjacent to the west boundary of the Upper Applegate watershed. In addition to loss of habitat to severe wildfire, competition from barred owls is also considered as one of the most pressing threats to the spotted owl. Disease and the effects of climate change were also identified as potential threats (USDI Fish and Wildlife Service 2011b).

Population and habitat trends –Recent range-wide meta-analysis for data through 2013 showed a range-wide, spotted owl population decline of 3.8 percent annually and an overall decline in occupancy rates in Oregon (Dugger et al. 2016). The realized population decline in Oregon since 1990 is from 31 - 64 percent. Dugger et al. also indicated that barred owl presence is having a strong positive effect on overall NSO extinction rates and a strong negative effect on colonization rates in some areas. The 2015 NWFP 20-year monitoring report estimate a net decrease of 6.7 percent in nesting/roosting habitat on federal lands in the Oregon Klamath Province since 1993 (Davis and others 2016). The decrease takes into account the loss of habitat to wildfire, timber harvest, insects and other causes; with some of those losses offset by forest succession. For this province, wildland fire accounted for nine times more acreage lost than timber harvest. Dispersal habitat also had a net loss of 4.4 percent on federal lands with a similar degree of habitat loss due to wildfire.

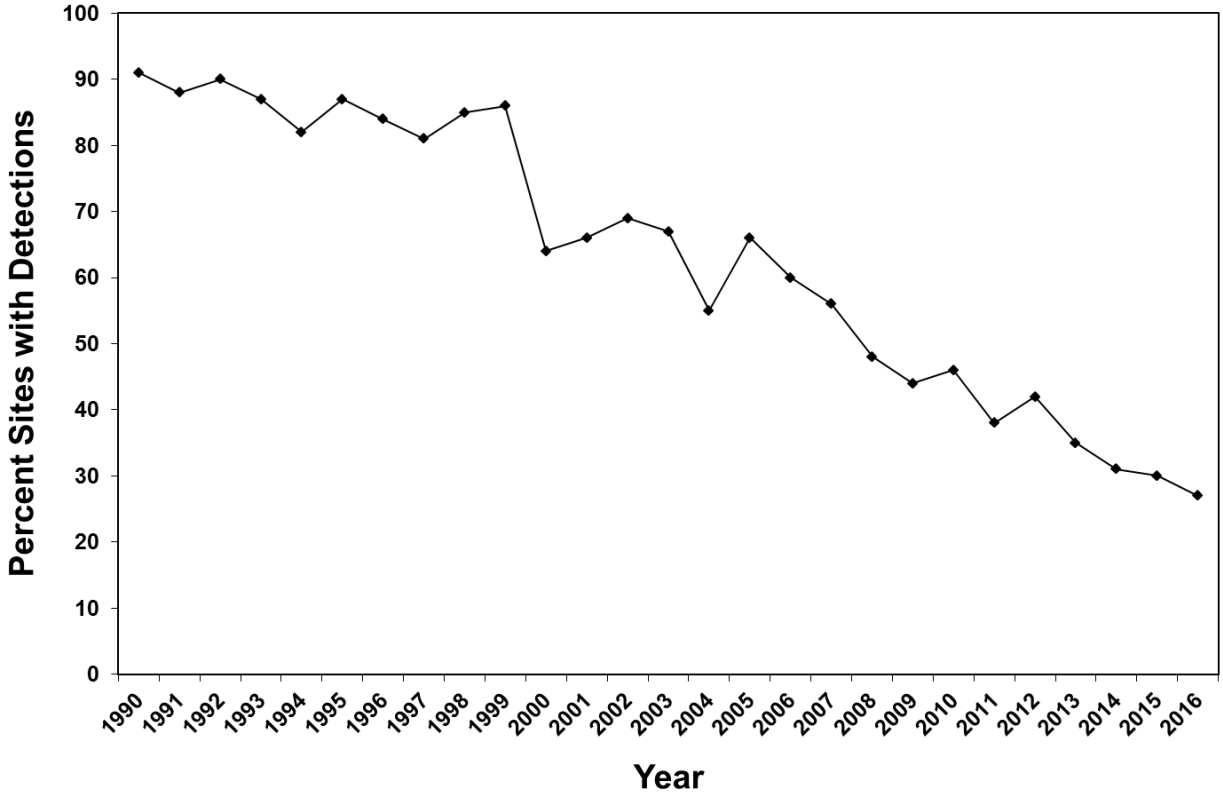
Survey history – Protocol surveys of all known historic owl sites occurred in both 2016 and 2017 within the Upper Applegate watershed. One NSO pair was detected at one site in early 2017, but no reproduction was confirmed and only a male was detected at the site in 2018. One other pair was detected at night in 2016 but could not be relocated during daytime follow ups. There were no NSO or barred owl responses within the Upper Applegate watershed in 2016. Because surveys may not continue to occur through the duration of the project, known sites and un-surveyed suitable nesting, roosting, and foraging (NRF) habitat outside of known nest patches will be assumed to be occupied and certain project activities would be restricted to minimize disturbance during the critical breeding season.

Description of suitable owl habitat – In the Oregon Klamath Province, owl dispersal-only habitat is forest stands with average tree diameters are ≥ 11inches DBH, canopy closure is ≥ 40 percent and there is enough open space beneath the canopy for an owl to fly through. Nesting, roosting and foraging habitat for owls is generally older than 80 years with an average tree diameter of 21 inches diameter at breast height (DBH), basal areas between 180 and 240 square feet/acre and canopy closure ≥ 60 percent. NRF habitat also serves as dispersal habitat and contains adequate dead wood to support owl prey species; such as, northern flying squirrels, red tree voles, wood rats and other small mammals.

Owl Sites within the Southern Oregon Cascades Demographic Study Area - Based on historic and current field surveys, the Forest, Anthony et al. (2008, 2009), and Dugger et al. (2010-2016a) has documented spotted owls within the proposed Upper Applegate watershed. Dugger et al. (2016b) claim that estimates of annual rates of population change and occupancy rates (Figure 12) from their study indicated that NSOs were continuing to decline in all parts of their range, and that the rate of decline was increasing in many areas, including southern Oregon and northern California. Dugger et al. (2016b) concluded that their findings were consistent with other studies that have found links between habitat and demographic rates of NSOs and provided support for previous recommendations to

preserve as much high-quality habitat in late successional forests as possible across the range of the subspecies (Forsman et al. 2011). However, barred owl densities may now be high enough across the range of the NSO that, despite the continued management and conservation of suitable owl habitat on federal lands (Davis et al. 2011, 2015), the long-term prognosis for the persistence of NSO may be in question without additional management intervention.

Figure 12. Percentage of all sites surveyed annually with ≥ 1 spotted owl detected on the South Oregon Study Area, Rogue River-Siskiyou and Fremont-Winema National Forests, Oregon 1990-2016. (adapted from Dugger et al. 2016a).



Owl habitat within UAW Action Area

For this analysis the action area is the area within 1.3 miles of proposed treatment units. This distance represents the approximate home range distance of northern spotted owls in the Oregon Klamath province and provides the area for evaluating effects of project activities on owl home ranges that overlap proposed treatment units. This action area includes 45,000 acres in federal ownership of which 23% are currently spotted owl NRF habitat. 63 percent of federal NRF acres are in reserved land allocations (e.g., LSR, Riparian Reserves, Congressionally Designated). In addition, approximately 46% of federal acres in the action area are currently dispersal-only habitat. (Table 28)

Table 28. Northern Spotted Owl Habitat Baseline for UAW Analysis Area

NORTHWEST FOREST PLAN	TOTAL ACRES	NSO NRF[1] HABITAT ACRES (% TOTAL)	CAPABLE[2] NSO HABITAT ACRES (% TOTAL)	RESERVED ACRES[3] (% OF TOTAL)	NON-RESERVED ACRES (% OF TOTAL)	DISPERSAL[4] ACRES TOTAL (% OF TOTAL)
OWNERSHIP						
All Ownerships	52,293	10,947(21%)	6,381(12%)	19,606(37%)	25,846(49%)	23,447(#%)
Private, State, and other Federal and non-Federal Government	6,840					
Federal RR-SNF/BLM	45,452	1,0450	5,521	13,893	18,500	20,823
LAND ALLOCATION - FEDERAL (*hierarchal, no acres double-counted*) RR-SNF Only						
Congressionally Reserved or Administratively Withdrawn Areas	74	2	30	74	0	18
Late-Successional Reserves (mapped)	19,531	5,001	5,521	5001	0	5725
100-Acre Spotted Owl Core Areas in the Matrix	1,454	629	125	1454	0	533
Riparian Reserves (Matrix and AMA acres only)	6,512	1,260	923	1260	0	1810
Matrix/Adaptive Management Areas	25,830	5,469	3,433	0	5469	551
Spotted Owl Critical Habitat						
Critical Habitat Unit - SubUnit	**Acres**	**NRF Habitat[2] Acres**	**Capable[4] NSO Habitat Acres**	**RESERVED[1]**	**NON-RESERVED**	**DISPERSAL[3]**
UNIT 9 Total	663,232	399,558	87,877	346,604	316,648	147,434
9 KLW 4 RR-SNF	82,817	54,428	9,508	24,686	57,868	15,934
KLW-4(within AA)	11,363	4,799	1463	3,256	1,273	2,319
UNIT 10 Total	775,558	509,979 (66)	85,029 (11)	355,592 (70)	419,966	159,858
10 KLE 6 RR-SNF	86,503	54,124	11,077	25,276	60,730	18,437
KLE-6 (within AA)	13414	2,763	1,522	831	1,841	1,629

Table Notes:

[1] NRF Habitat: consists of habitat used by spotted owls for nesting, roosting, and foraging. Generally, this habitat is multistoried, 80 years old or older (depending on stand type and structural condition), and has sufficient snags and down wood to provide opportunities for nesting, roosting, and foraging.

[2] Capable Habitat: forestland that is currently not habitat but can become NRF or dispersal in the future, as trees mature and the canopy closes.

[3] Reserved land allocation with no programmed timber harvest which includes Administratively Withdrawn, Congressionally Reserved, LSR's, Owl Cores and Wild and Scenic River Corridors.

[4] Dispersal Habitat: All- dispersal is defined as dispersal plus NRF. Throughout this document, "dispersal" will be used to describe dispersal-only habitat. Thomas *et al.,* 1990, defined dispersal habitat as forested habitat more than 40 years old, with canopy closure more than 40 percent, average diameter greater than II inches, and flying space for owls in the understory and does not provide the components.

Proposed treatment units include NRF and dispersal habitat for northern spotted owls. The 2011 Revised Recovery Plan for the Northern Spotted Owl provides considerations and treatment guidelines when designing forest restoration projects (USDI Fish and Wildlife Service 2011b).

Treatment objectives were influenced by the desired condition for the stand based on potential contribution to the overall function and resilience of the watershed. In addition, the MAXENT Relative Habitat Suitability (RHS) Model developed by the US Fish and Wildlife Service in its current Spotted Owl Recovery Plan (FWS 2011, Appendix C) was used in development of treatments based on the abiotic suitability of a site for NSO nesting habitat. Areas identified as low RHS in the Klamath and South Cascade Mountains province are generally on or near primary ridgetops, southerly tending slopes and in habitat not likely to support nesting and roosting habitats. For example, treatments proposed in strategic locations are intended to reduce fuels and risk of high severity fire and provide opportunities to introduce prescribed fire into the watershed at a scale that would maintain certain desired habitat types such as open, late seral with large ponderosa and sugar pine, and mature oak trees. NRF habitat in these strategic locations is generally considered low quality nesting habitat for spotted owls. Owls are not known to nest on these ridges; they tend to be warmer, drier and more exposed than drainages and northerly aspects commonly occupied by NSO.

Conversely, dispersal habitat that occurs in areas of high relative habitat suitability are proposed for treatments that would enhance their development into NRF (USDI Fish and Wildlife Service 2011b)

There are 25 NSO home ranges within 1.3 miles of the Proposed Action that overlap portions of the treatment units. The NRF minimum thresholds for owl site viability are 50 percent for the core area and 40 percent for the home range (Courtney and others 2004; Thomas and others 1990). Seven sites are at the minimum or above threshold for the core area. At the home range scale, nine sites are at or above the minimum thresholds. Sites with NRF habitat below threshold are less likely to support successful reproduction and fledging for northern spotted owls.

Following are the potential effects to NSO and their habitat, both negative and positive, that could result from the proposed treatment activities. The extent and intensity of these effects will be evaluated for each species identified previously as known or likely to occur in the Upper Applegate watershed. The effects of these activities to each species are evaluated relative to the type of proposed treatment because each treatment has a different intensity of activity.

- *Thinning and yarding activities*
    - – Decrease in or removal of canopy closure and understory; modification of habitat
    - – Incidental destruction of existing down wood or snags; or felling of existing snags and danger trees.
    - – Direct mortality from equipment and tree felling.
    - – Noise disturbance
    - \+ Maintenance of shade-intolerant species and meadows
    - \+ Acceleration in development of large trees and complex stand structure.
    - \+ Increased tree growth for future large dead wood.
- *Fuels treatments and burning*

  - Smoke disturbance during breeding season.
  - Reduction of understory habitat elements (short and long-term)
  - Direct mortality from burning (e.g. mollusks, insect larvae)
  + Long-term maintenance of open canopy, fire-adapted and shade-intolerant species
  + Increase in fire resiliency of trees in burned areas
  + Increased opportunities for wildland fire containment

- *Temporary road and landing construction or reconstruction*
  - Localized, short-term habitat removal/modification

- *Road closure and decommissioning*
  + Reduction of human disturbance
  + Reduction of habitat fragmentation

- *Hauling of removed material*
  - Noise disturbance

The proposed action will treat and maintain up to 3,912 acres of NRF habitat (37%) (Table 29), the primary treatments are prescribed fire and using fire to maintain previously underburned NRF habitat. Up to 3,457 acres of this habitat would be treated by underburning and using fire to reduce ground and ladder fuels. The primary structure and function of NRF would not be affected. Up to 661 acres of NRF would be treated with non-commercial thinning: 221 acres in unmanaged stands; 33 acres thinning in managed stands; and 38 acres within legacy tree thinning units. All of these activities would also maintain the primary structure and function of NRF. Some commercial thinning in unmanaged stands (251 acres) would downgrade NRF habitat (120 acres). This represents one percent of the total NRF habitat within the analysis area.

Table 29. Vegetation Treatments and spotted owl habitats

Treatment Type	Non-forest (acres)	Capable (acres)	Forested, not NRF (acres)	Dispersal (acres)	NRF (acres)	PFF[1] (acres)	Total acres
Fuel Maintenance	749	1,548	2,645	2,798	2330	305	10,375
Legacy Thin	2	41	40	117	38	0	238
Unmanaged Non-commercial Thin and Fire	25	95	176	190	221	1	708
Prescribed Fire	584	502	1,808	1,107	885	0	4,886
Unmanaged Commercial Thin and Fire	31	96	187	345	251	0	910
Plantation Non-commercial Thin and Fire	199	508	713	646	154	0	2220
Plantation-Commercial Thin and Fire	24	51	32	646	33	0	786

Treatment Type	Non-forest (acres)	Capable (acres)	Forested, not NRF (acres)	Dispersal (acres)	NRF (acres)	PFF[1] (acres)	Total acres
Total Acres	1,614	2,841	5,601	5,849	3,912	301	20,123
[1] Post Fire Foraging							

Dispersal-only habitat conditions can be highly variable but in general consist of forested stands with moderate canopy cover that are dominated by smaller, single aged trees with little if any structural features other essential habitat components for nesting or roosting. Effects to dispersal-only habitats are evaluated at a larger landscape scale due to the life history function of dispersal habitat. The RR-SNF has determined that all proposed treatments would affect 5,849 acres of dispersal habitat (28 percent of the analysis areas dispersal-only habitat) associated with these projects. The nature of the action and the distribution of effects alone is not expected to be significant overall and would not preclude the ability of NSO to disperse across this landscape. In summary,

- Canopy cover in treated stands would be maintained at 40 percent; and
- Maintenance activities within dispersal would not remove the components important to owls: trees 11 inch diameter or greater, flying space, and some prey habitat. Any large, remnant standing and down dead wood would be maintained unless they are a danger along roads.
- The amount of basal area maintained would depend on site specific conditions to ensure the stand would still function as dispersal habitat.
- The proposed treatments would be dispersed throughout the Section Seven watersheds to minimize the potential for adversely affecting spotted owl dispersal.
- In addition to the dispersal habitat that would be maintained (or improved in over dense young stands), all NRF would be maintained. NRF provides high quality habitat for dispersing owls.

Owl sites are analyzed at the nest patch, core area, and provincial home range scales. PDC's would be applied to all sites within or adjacent to project units to reduce or eliminate the impacts from potentially disturbing noise or activity near owl sites. There would be removal PFF due to the need to reduce or eliminate the danger proposed by these trees to the public and agency personnel. NRF habitats will not be downgraded or removed, nor will dispersal-only habitat be removed. Therefore, the NRF thresholds at the nest patch, core area, and home range scales would not be reduced except for the removal of PFF which could be used for foraging or roosting for at least the short term and for the purposes of this assessment.

UAWRP also proposes to conduct rare plant, hardwood, pine and oak restoration activities. These activities will not affect spotted owl habitats but may be restricted for disturbance if within disturbance distances depending on the activity (Table 30).

Table 30. Rare plant oak, hardwood and pine restoration

Treatment Type	Non-forest acres	Capable acres	Forested not NRF acres	Dispersal acres	NRF acres	PFF acres	Total acres
FRGE conservation	159	71	720	0	0	0	950
Hardwood enhancement	66	23	153	0	0	0	242
Oak and pine	137	58	688	0	0	0	883
Pollinator habitat enhancement	579	408	1,513	0	0	0	2500
Total acres	941	560	3,074	0	0	0	4575

Effects to Spotted Owls from Habitat Modification

The current habitat baseline, occupancy and reproductive status and effect to all spotted owl sites are displayed in Appendix F. There are currently 25 owl sites within 1.3 miles of the UAW project. Of all the known sites, only three sites would have activities that may result in adverse impacts to those three sites.

Two USFS sites, owl sites 1126 (Nine Dollar Gulch) and 1163(Lime Gulch) would each have NRF reduced with their respective home ranges by 116 acres. This would reduce the available NRF for the 1163 owl site by 2 percent, it is currently at 33 percent within its home range. The Lime Gulch site was not occupied in 2016-2017. Owl site 1126 (Nine Dollar Gulch) would also have NRF reduced within its home range by 116 acres. This site has been unoccupied since 2006. This would result in a four percent reduction in the available habitat within its home range. Both sites are below minimum guideline for the amount of habitat within owl home ranges. This unit is high up on the ridge near Palmer Creek on a south facing slope and the Proposed Action proposes to downgrade it in order to favor pine and reduce fuels along the ridge. It is unlikely that this would ever be used for nesting as it is very low relative habitat suitability, however it could be used as foraging and owl may avoid the area for some years post treatment.

The BLM owl site 22330 (Lightning Gulch site) would have NRF within its home range reduced by 36 acres. This site has not been occupied since 2007. This would reduce the available NRF for the 1163 owl site by 2 percent, it is currently at 35 percent within its home range and post treatment there would be 33 percent NRF available within its home range. This unit is high up on the ridge on the other side of Star Gulch where the lightning gulch pair is located near Palmer creek on a south facing slope and the proposed action proposes to downgrade it in order to favor pine and reduce fuels along the ridge. It is unlikely that this would ever be used for nesting as it is very low relative habitat suitability, also given its location in another sub basin it is unlikely that it would be used as foraging, however if it is used by these birds they may avoid the area for some years post treatment. This proposed action would may affect and is likely to adversely affect these three spotted owl sites.

All other activities within all other respective spotted owl sites would may affect, not likely to adversely affect spotted. However given that there are many acres of NRF proposed for prescribed fire and fuels maintenance within home ranges of several owls, a mitigation measure is recommended that no more than 20 percent of the NRF should be treated within any owl home range within a given year.

Effects to Designated Spotted Owl Habitats

The proposed action would treat and maintain 1,126 acres of NRF habitat (23%) and up to 1,067 acres of dispersal only habitat(46%) from KLW-4. The proposed action would also treat and maintain 33 acres of NRF habitat (1%) and up to 1,314 acres of dispersal only habitat(80%) from KLE-6, almost all of it in plantations or with prescribed fire and fuels maintenance (Table 31).

Table 31. Effects to NSO Critical Habitat from the Proposed Action

	NRF Removed (acres)	NRF Downgrade (acres)	NRF T&M (acres)	Dispersal-Only Removed (acres)	Dispersal-Only T&M (acres)	Total Habitat Acres Treated
KLW-4	**4,799**			**2,319**		
All treatments			1,126		1,067	**2,153**
KLE-6	**2,763**			**1,629**		
			333		1,314	**1,647**
% Change to KLW-2 Baseline Habitat	**0**	**0**	**No Change**	**0**	**No Change**	

The effects of all vegetation treatments within the two CHUs for spotted owls is "May Affect, not likely to Adversely Affect" Designated spotted owl critical habitat.

Effects to Northern Spotted Owls from Disturbance

The potential for noise-producing activities to cause harassment of spotted owls is dependent on the background or baseline levels of noise present in the environment. In areas that are continually exposed to higher ambient noise levels (e.g., areas near road Maintenance Level 3 and above, well-traveled roads), spotted owls are probably less susceptible to small increases in noise frequency because they are accustomed to such activities. Spotted owls do occur in areas near human activities and may habituate to certain levels of noise. However, spotted owls rarely nest at or immediately adjacent to roads or edges (Kerns and Allwardt 1992). It is unlikely NSOs will nest within the road prism proposed for treatments. Effects to spotted owls resulting from noise, human intrusion or smoke-related disturbance are not well documented. In the most recent review of spotted owl research, none of these types of disturbance were considered a threat to the species (Courtney et al. 2004). However, at the individual level, based on anecdotal information and effects to other bird species (Wesemann and Rowe 1987, Delaney et al. 1999, Delaney and Grubb 2001, Swarthout and Steidl 2001, USFWS 2003, USFWS 2005, USFWS 2012), disturbance to owls is thought to increase with proximity to the activity and an increase in noise level, similar to results reported for bald eagles (Grubb and King 1991), gyrfalcons (Platt 1977), and other raptors (Awbrey and Bowles 1990). The potential effects of elevated stress hormones on spotted owl population dynamics are not well understood. However, chronic high levels of stress hormones (corticosterone) may have negative consequences on reproduction or physical condition in birds.

No vegetation activities are proposed during the critical breeding season for spotted owls within or within disturbance distances of spotted owl habitat. All of the Proposed Action would have appropriate seasonal restrictions.

Effects to Northern Spotted Owls from Trail Proposals

The proposed action also proposes to create 16 to 18 miles hiking trails, decommission 1.5 miles of motorized trails, and authorize up to 6 miles of motorized trails. With respect to spotted owls, recreational disturbance can cause adverse impacts to spotted owls during the breeding season both on motorized and non-motorized trails. While flush distances were relatively low from hikers, motorized traffic can have an effect further outside any roads or trail. A proposed 1.5 mile single-track motorized route on the Hanley Gulch Road would pass through largely NRF habitat. Motorized noise on this trail could impact up to 38 acre of NRF habitat (1.5 miles and 35 yards on each side of the trail due to motorized disturbance) and it also passes through a spotted owl nest patch and 100 acre core area. The recommendations for this route would be to restrict all motorized traffic along the route from March 1 through June 30 unless surveys show that these owls are not breeding during a given year. If seasonal restrictions are followed during the critical breeding period the effect determination for spotted owl is May Affect, Not Likely to Adversely Affect the northern spotted owl

No non-motorized trail is proposed for any owl site or nest patch; therefore no seasonal restrictions for owls would be expected.

The reductions in motorized trails from proposed decommissioning within NSO habitat would be a beneficial effect for spotted owl; May Affect, Not Likely to Adversely Affect the northern spotted owl.

Summary and Conclusions

The northern spotted owl would have short-term impacts with long-term benefits as a result of proposed activities from habitat modification and disturbance. Because activities are likely to adversely affect spotted owls and designated critical habitat, formal consultation with the Service has been initiated. All mandatory conservation measures (project design criteria and mitigation measures) and terms and conditions from the biological opinion would be implemented.

Vegetation treatments will **May Affect and are Likely to Adversely Affect** northern spotted owls due to the downgrading of 120 acres of NRF habitat. All other treatments would maintain spotted owls and spotted owl habitat. Rare plant, oak and pine habitat restoration would **May Affect, Not Likely to Adversely Affect** spotted owl due to disturbance and will have no effect to spotted owl Designated Critical Habitat. All trail proposals will **May Affect, Not Likely to Adversely Affect** spotted owls. All Required project design criteria will be followed to ensure these effects determinations.

N. AQUATIC HABITAT AND FISH

Activities associated with restoration treatments and new trail development, along with other connected actions, may affect aquatic species and habitats, including Threatened, Endangered, or Sensitive species and/or Critical Habitat.

Threatened, Endangered, and Sensitive Aquatic Species

In compliance with Section 7 of the Endangered Species Act (ESA) and the Forest Service Biological Evaluation (BE) process for Threatened, Endangered, and Sensitive fish species (Rogue River NF LRMP page 4-20), the USDA Forest Service Region 6 Sensitive Species List (updated July 13, 2015), and the Oregon/Washing BLM Sensitive Species List (updated July 29, 2015) were reviewed and field reconnaissance was conducted in regard to potential effects on any of these species by actions associated with the Upper Applegate Watershed Restoration Project. The results are summarized in the Table 32 below.

Table 32. Potentially Affected Species, Status, and Habitats Assessed

Species/Habitat		Pre-field Review	Field Surveys
Common name	**Scientific Name**	**Existing Sighting or Potential Habitat[1] (Yes/No)**	**Habitat or Species Confirmed[1] (Yes/No)**
ESA Threatened Species			
SONCC Coho salmon	*Oncorhynchus kisutch*	Y	Y
OC Coho salmon	*O. kisutch*	N	N
S. DPS North American green sturgeon	*Acipenser medirostris*	N	N
S. DPS Pacific eulachon	*Thaleichthys pacificus*	N	N
ESACritical Habitat (CH)			
SONCC coho salmon	*O. kisutch*	Y	Y
OC coho salmon	*O. kisutch*	N	N
MSA Essential Fish Habitat (EFH)			
Coho salmon	*O. kisutch*	Y	Y
Chinook salmon	*O. tshawytscha*	Y	Y
R6 Forester's and BLM OR State Sensitive Species			
Fish			
Pacific lamprey [2,3]	*Entosphenus tridenttatus*	Y	Y
KMP steelhead [2,3]	*O. mykiss*	Y	Y
OC steelhead [2,3]	*O. mykiss*	N	N
SONCC Chinook salmon [2,3]	*O. tshawytscha*	Y	Y
Jenny Creek sucker [3]	*Catostomus rimiculus*	N	N
Umpqua chub [3]	*Oregonichthys kalawatseti*	N	N
Mollusk			
California floater [2]	*Anodonta californiensis*	N	N
Western ridged mussel [2]	*Gonidea angulata*	N	N
Highcap lanx [2,3]	*Lanx alta*	N	N
Scale lanx [2,3]	*L. klamathensis*	N	N
Rotund lanx [2,3]	*L. subrotunda*	N	N
Robust walker [2]	*Pomatiopsis binneyi*	N	N
Pacific walker [2]	*P. californica*	N	N
Montane peaclam [3]	*Pisidium ultramontanum*	N	N
Insect			
Haddock's Rhyacophilan caddisfly [2]	*Rhyacophila Haddocki*	N	N
A caddisfly [3]	*R. leechi*	N	N

[1] **Yes** – The proposed project's potential effects on these species will be further analyzed in this document.
[1] **No** – No further analysis is necessary, and a determination of "No Impact" is rendered.
[2] Forest Service Sensitive
[3] Bureau of Land Management Sensitive

Status of Listed Species, Essential Fish Habitat, and Critical Habitat for SONCC Coho Salmon

Southern Oregon/Northern California Coasts (SONCC) Coho Evolutionarily Significant Unit (ESU) was listed as threatened on August 10, 1998 (63 FR 42587). This listing was reevaluated and NMFS determined listing SONCC Coho was not warranted on January 17, 2006.

The listing was once again reevaluated and NMFS determined a listing of threatened was warranted on February 4, 2008 (73 FR 7816). SONCC Coho salmon critical habitat was designated as threatened also on February 11, 2008 (73 FR 7816). Final protective regulations for SONCC Coho salmon were issued on February 11, 2008 (73 FR 7816). On April 28, 2009 NMFS announced that it was initiating a status review of SONCC Coho. On May 26, 2010, NMFS affirmed the listing of the SONCC Coho salmon as Threatened (75 FR 29489). The Final Recovery Plan for the SONCC Coho was issued by NMFS on September 30, 2014 (79 FR 58750) (NMFS 2014).

Critical habitat is defined in Section 3(5)(A) of the ESA as "the specific areas within the geographical area occupied by the species Southern Oregon/Northern California Coasts Coho on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection." Section 7 of the ESA prohibits the destruction or adverse modification of designated critical habitat (CCH). Critical Habitat for SONCC Coho salmon was designated May 5, 1999 (64 FR 24049) as all accessible reaches or rivers (including estuarine areas and tributaries) between the Mattole River in California and the Elk River in Oregon, inclusive. Critical habitat includes all waterways, substrate, and adjacent riparian zones below longstanding, naturally impassable barriers (i.e. natural waterfalls in existence for at least several hundred years). Coho occupied habitat within the Upper Applegate watershed includes: Applegate River, Palmer Creek, Beaver Creek, and Star Gulch.

Essential Fish Habitat

Interim final rules for Essential Fish Habitat (EFH) under the Magnuson-Stevens Act (16 U.S.C. 1855(b)) were published in the Federal Register/ Vol. 62, No. 244, December 19, 1997 and final rules published in the Federal Register/ Vol. 67, No. 12, January 17, 2002. These rules are pertinent to Chinook salmon and Coho salmon habitat within the Southern Oregon Coastal Basin. Essential Fish Habitat (EFH) has been defined by NMFS as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." This definition includes all waters historically used by anadromous salmonids of commercial value. EFH within the Upper Applegate watershed is the same as CCH.

Action Area

The Action Area, as defined by the Endangered Species Act (ESA), is all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action [50 CFR § 402.02]. The Action Area not only includes the immediate footprint of the harvest and road related activities, but any downstream reaches which may be affected indirectly. The ESA Action Area is also analyzed for Forest Service and BLM Sensitive Species.

The proposed action is located within the Upper Applegate River 5th field watershed. All proposed project activities would occur within the Upper Applegate River 5th field watershed. All potential effects are also expected to occur within the boundaries of this watershed.

Pacific Lamprey (FS/BLM Sensitive)

Pacific lamprey occur within the Applegate sub-basin, including the Upper Applegate River watershed. Within the Upper Applegate watershed, Pacific lamprey are known to occupy the mainstem Applegate River.

The USFWS was petitioned to list the Pacific lamprey (and three other lamprey species) under the ESA in 2003. In 2004, the USFWS found that the petition did not present substantial scientific or commercial information to warrant listing. The petition finding did, however, recognize that Pacific lamprey have declined in the Columbia River basin and in many other parts of their range.

SONCC Chinook Salmon (FS/BLM Sensitive)

Fall-run SONCC Chinook salmon occur within the mainstem Applegate River within the Upper Applegate River watershed. The SONCC Chinook ESU was determined to be not warranted for listing under the Endangered Species Act, by the National Marine Fisheries Service on September 16, 1999 (64 FR 50394). This ESU is listed as a Sensitive Species on the USFS Region 6 and OR/WA BLM Special Status Species List.

KMP Steelhead (FS/BLM Sensitive)

Winter and summer run Klamath Mountain Province (KMP) steelhead occur within the Upper Applegate River watershed, notably within the Applegate River mainstem, Star Gulch, Palmer Creek, Beaver Creek and various other smaller tributaries. The KMP steelhead trout distinct population segment (DPS) was proposed as threatened under the ESA on August 9, 1996 (61 FR 41541), but was found not warranted for listing. KMP steelhead is currently listed as a species of concern by NMFS and as a Sensitive Species by the USFS Region 6 and OR/WA BLM.

Other Species (FS/BLM Sensitive)

Forest Service Sensitive species: California floater, Western ridged mussel, highcap lanx, scale lanx, rotund lanx, robust walker, Pacific walker, Haddock's Rhyacophilan caddisfly, and Oregon Coast (OC) steelhead are not known to occur or have suitable habitat within proximity to any of the activities included within the proposed action. Additionally, BLM Sensitive species: Jenny Creek sucker, Umpqua chub, montane peaclam, and *Rhyacophila* leechi are not known to occur or have suitable habitat within proximity to any of the activities included within the proposed action. As such, a **No Impact** determination is rendered and these species will not be discussed further within this document.

Recreational Fisheries

Coho and fall Chinook salmon produced in this watershed contribute to in-river sport fisheries in the Rogue River and Chinook are taken in commercial off-shore fisheries. Steelhead produced in this watershed contribute to recreational fisheries in the Rogue and Applegate Rivers. While most streams in this watershed are closed to angling, the Applegate River is open to winter steelhead and trout angling. With much of the Applegate River main stem in private ownership, Forest Service parcels in this watershed at Jackson Campground, Flumet Flat, Placer, and McKee Bridge provide important fishery access to the public.

Fish Habitat

In general, fish habitat in Applegate River and its tributaries has been substantially altered from pre-European condition. Various human activities have reduced the quality and quantity of fish habitat in this watershed. The Applegate River has been dammed, channelized, diked, experienced wood extraction, water withdrawal, and currently lacks substantial off-channel habitats important for fish rearing. Management activities that have reduced the quality and quantity of fish habitat in Beaver and Palmer Creeks, and Star Gulch include: road-building, timber harvest (especially in the riparian area), stream cleanout, water diversion, and hydraulic and placer mining (USDA 1994).

Large wood has been added to sections of the Applegate River, Beaver Creek, Palmer Creek, and Star Gulch during various instream projects dating back to the 1990s. These projects have individually and cumulatively contributed towards improved fish habitat within these streams, including for federally listed SONCC Coho salmon. However, even with these noteworthy improvements to instream habitat, stream surveys completed in recent years have documented that there is still opportunity to continue to work towards higher quality and more complex habitat within these important streams. Stream surveys completed in 2013 on Beaver Creek and Palmer Creek documented low large wood densities and a limited amount of complex, deep slow water habitat (Siskiyou Research Group 2013a, Siskiyou Research Group 2013b).

The Proposed Action does not include any work occurring directly within stream channels or other aquatic habitat that contain aquatic biota. As such no direct effect to aquatic biota species or habitat are expected.

Vegetation Thinning, Yarding, and Haul

Implementation of the Northwest Forest Plan accommodates vegetation treatment necessary or desirable to restore ecological health in Riparian Reserves that have been harvested or affected by fire exclusion or other disturbance. The Northwest Forest Plan Temperature Strategy, demonstrates that thinning can occur in the Riparian Reserve without affecting stream shade if the overstory canopy in the primary shade zone is not treated.

No impacts to stream temperature would be expected from thinning because existing stream shade would be maintained. Thinning activities would be implemented in accordance with Project Design Criteria, such that the overstory in the primary shade zone is not degraded.

Skidding and yarding of logs could result in a loss of ground cover, displacement of soil, and compaction of soils (Chamberlain et al. 1991). This could increase upland erosion rates and fine sediment influx into adjacent streams within the Upper Applegate watershed. However, all units (Unit #s 54, 55, and 62) associated with fish bearing streams that would receive commercial thinning treatments are helicopter harvest units. Thus, there is no ground disturbance expected or other causal mechanism that would result in sediment influx into the associated stream systems from thinning activities within these units. Additionally, Unit 61 (cable yarding unit) is located upslope from and within the outer Riparian Reserve of Armstrong Gulch, a small resident trout stream. Implementation of the riparian PDCs (i.e. riparian buffer) would prevent harvest generated sediment from entering Armstrong Gulch adjacent this unit. Armstrong Gulch is located approximately 0.75 mile upstream of CCH in Beaver Creek.

Adherence to project PDCs would implement a minimum 25 foot no-cut buffer on all streams and a 100’ buffer in which no equipment would be allowed. The 100 foot buffer is designed to limit soil disturbance and the potential for sedimentation into streams. By implementing the mandatory buffer widths, there would be no increase in fine sediment delivery to a stream or associated increase in turbidity from thinning activities.

No new temporary roads would be constructed in Riparian Reserves or across any stream channels; therefore, temporary road construction does not have a mechanism to contribute sediment to the aquatic system.

Timber haul would occur near streams at existing crossings. Haul would occur during dry weather conditions only. During wet weather conditions, sale administrators would cease haul and road maintenance actions when ditch lines begin to flow water and/or roadbeds begin to saturate. Haul routes in proximity to CCH are listed in table below. Adherence to these dry haul standards would ensure no project related sediment effect to adjacent stream channels.

Table 33. Haul routes

Road #	Associated Stream	Road Surface/Status
FS 1095	Palmer Creek	Gravel/storm proofed
FS 1095500	Lime Gulch	Gravel/storm proofed
FS 2000940	Charlie Buck Gulch	Gravel/storm proofed
FS 2000	Beaver Creek	Paved
BLM 39-3-28	Star Gulch	Paved

Fuels Treatment

The proposed action includes prescribed fire and fuels thinning treatments in proximity to the Applegate River, Palmer Creek, Beaver Creek, Star Gulch, and some of the smaller fish bearing tributaries to these streams. The physical cutting, piling, and/or scattering of fuels within the Upper Applegate watershed would not result in effects to aquatic biota outside of those disclosed for other project activities.

Prescribed fire and associated thinning of small diameter within the Riparian Reserve of fish bearing streams has the potential to result in some short-term negative effects to aquatic biota and their habitats, including federally listed SONCC Coho salmon. These prescribed burns would occur when fuel moisture and weather conditions are appropriate achieve a desired low-mixed severity, mosaic burn characteristic, and low mortality of residual trees.

The use of low-mixed severity prescribed fire to treat fuels within the Upper Applegate watershed would result in loss of ground cover and potential minor loss of stream shading. It is possible that ash generated from prescribed fire treatments could enter stream channels. Influxes of ash into a stream system can cause a short-term shift in water chemistry, towards a more alkaline state, and could adversely affect aquatic biota populations (USDA Forest Service 2005). However, these shifts in water chemistry are not expected to exceed suitable habitat conditions for fish present within the Upper Applegate watershed. Therefore, effects to fish populations from ash influx are unlikely and not anticipated.

Ignition of prescribed fire would occur greater than 100 feet from all perennial streams; though, these burns would be allowed to naturally "back" into this 100 foot buffer as vegetation conditions allow. The naturally higher relative humidity and presence of riparian vegetation would be expected to attenuate effects from these burns in proximity to fish bearing habitat, thereby allowing for maintenance of suitable fish habitat conditions within the associated streams (Arkle and Pilliod 2010).

Within Riparian Reserves on BLM managed lands, prescribed fire would be implemented as outlined in the ROD/RMP for Southwestern Oregon (USDI 2016). The ROD/RMP allows fuels treatments within Riparian Reserves as needed to reduce the risk of stand-replacing crown fire, but prohibits treatments within 60' of fish bearing and perennial streams, and requires a retention of 50% canopy cover remain per acre, and prohibits cutting of any trees greater than 12" DBH.

Outside of the 60', the remainder of the Riparian Reserve may be treated to 30% canopy cover and down to 60 trees per acre. Adjacent to intermittent, non-fish bearing streams, treatments may occur adjacent to the channel, but must leave 50% canopy cover within the inner 50' of the Riparian Reserve either side of the channel, and trees greater than 12" DBH must not be cut. Outside of 50', moderate severity burns must be limited to less than 20% of the area of the Riparian Reserve within each HUC 12 sub-watershed, and 2% down woody material must be retained on the forest floor following treatment.

Fuels reduction would reduce the risk of catastrophic wildfire (USDA Forest Service 2004). Intense wildfires can open streams to solar warming, especially where forest cover is eliminated. Reduction or elimination of forest and understory cover generally results in an increase in surface erosion, particularly over the following winter. Understory vegetation typically recovers rapidly; however, an intense wildfire would likely result in a flush of sediment into the stream network during the first winter and spring. Potential reduction of severe fire behavior and its effects is a beneficial effect of the proposed action to aquatic biota and habitat.

Road Restoration

The proposed action includes approximately 3 miles of road restoration activities. However, these restoration actions are generally not located in proximity to fish bearing habitat. Specifically, the proposed road restoration at FS Road 1010500 and the unnumbered FS spur located near Jackson Campground are not located in proximity to any fish bearing streams. Restoration actions at these road segments would contribute to the cumulative beneficial effect to decreased road sediment production and improved water quality related to road restoration work within the Upper Applegate watershed. However, no impact to aquatic biota or habitat would be expected from the road restoration work at these two locations.

Stormproofing of FS Road 2000920 would have beneficial effects to aquatic habitat in adjacent Armstrong Gulch, through the reduction of road generated sediment. This action would also cumulatively contribute to the improved water quality within the Beaver Creek sub-watershed, particularly in concert with the road restoration work that was completed as part of the FS Applegate River-McKee Bridge Legacy Roads Project in 2010.

Recreation Activities

The proposed action includes new motorized single-track trails in the Beaver Creek sub-watershed. The proposed trails are largely located on existing abandoned trail and road segments. However, there would be some needed trail construction in steep locations and to connect the proposed trails to existing roads.

The proposed Cinnabar Lookout Trail is an existing abandoned trail that does not occur in proximity to any fish bearing streams or other aquatic habitat. Thus, there is no causal mechanism for effects to any aquatic biota or habitat.

The proposed Charlie Buck Trail is an existing abandoned trail that does not occur in proximity to any fish bearing streams or other aquatic habitat. The extreme northern end of this trail intersects the outer margin of the Beaver Creek Riparian Reserve, where the trail intersects and follows the decommissioned FS Road 2000941. Due to its location, not in proximity to fish bearing streams or other aquatic biota habitat, no effect to any aquatic biota or habitat is expected.

The proposed motorized trail along the decommissioned bed of FS Road 2010200 road is located almost entirely within the Riparian Reserve of Hanley Gulch. Hanley Gulch is small fish bearing tributary to Beaver Creek, which is occupied by steelhead, rainbow trout, and cutthroat trout. Hanley Gulch enters Beaver Creek approximately 1.6 miles upstream of CCH.

New non-motorized trail is proposed along existing ditch lines west of the Applegate River. This trail would run roughly between Kanaka Gulch and FS Road 1010500. This proposed trail would cross one fish bearing stream, Palmer Creek. This crossing would be an unimproved crossing, and would not affect the current aquatic habitat condition or trend.

Additional new non-motorized trail is proposed near Brushy Gulch on FS land and along the decommissioned Lady Bug Gulch road on BLM land. The Brushy Gulch trail is not located in proximity to any fish bearing stream or other aquatic habitat. The proposed Tallowbox Trail would be located along a decommissioned road bed adjacent to Lady Bug Gulch, a small cutthroat trout bearing tributary to Star Gulch. This decommissioned Lady Bug road crosses Lady Bug Gulch three times, two which are located within the cutthroat trout distribution of the stream.

The proposed action also would obliterate and restore unauthorized OHV trails located near Brushy Gulch, Jackson Campground, and Boulder City/FS Road 2000940. None of the routes are located in proximity to any fish bearing streams or other aquatic habitat. Thus, there is no causal mechanism for effects to any aquatic biota or habitat.

Past, present, and foreseeable future activities have the potential to work synergistically with the proposed activities in the Upper Applegate Watershed Restoration Project. The only effects identified to aquatic resources from project activities is from prescribed fire and fuels treatments within Riparian Reserves. These activities are designed to be beneficial to the riparian resource in the long-term, with limited short-term negative effects to aquatic habitat and associated aquatic biota. These short-term effects are cumulative with past prescribed fire and fuels treatments within the Upper Applegate River watershed on FS and BLM land, and with effects to the aquatic resource from the recent Burnt Peak Fire in 2017.

Conclusion and Determination of Effect

Prescribed fire and fuels treatments within Riparian Reserves included in the proposed action would result in short-term effects based on a review of best available science and professional judgment. Consequently, a determination of "*May Affect, Not Likely to Adversely Affect*" SONCC Coho salmon and its Critical Habitat is rendered. A determination of "*May Impact Individuals or Habitat, but will Not Likely Contribute to a Trend Toward Federal Listing or Cause a Loss of Viability to the Population or Species*" is made for KMP Steelhead, SONCC Chinook salmon, and Pacific lamprey. All other activities within proposed action would have no effect to SONCC Coho and CCH.

Essential Fish Habitat is the same as CCH in the Upper Applegate watershed. Therefore, the same determination of effect applies to EFH, as was disclosed above for CCH. The Upper Applegate Watershed Restoration Project would have a "*Not Likely to Adversely Affect*" to Essential Fish Habitat for Coho salmon and Chinook salmon.

This project fits under the categories described in the *Re-initiation of the Endangered Species Act Section 7 Formal Programmatic Conference and Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for Aquatic Restoration Activities in the States of Oregon and Washington* (2013 ARBO) for category #15. Riparian Vegetation Treatment (Controlled Burning). Therefore, no consultation with the National Marine Fisheries Service is required provided the Project Design Criteria (PDC) are followed.

Table 34. Effects Determinations

Species/Habitat Common Name	Proposed Action
ESA Threatened Species	
SONCC Coho Salmon	NLAA
OC Coho Salmon	NE
S. DPS Pacific Eulachon	NE
S. DPS North American Green Sturgeon	NE
ESA Critical Habitat (CH)	
SONCC Coho Salmon	NLAA
OC Coho Salmon	NE
MSA Essential Fish Habitat (EFH)	
Chinook Salmon	NLAA
Coho Salmon	NLAA
R6 Forester's Sensitive Species	
Fish	
SONCC Chinook Salmon	MIIH
OC Steelhead	NI
KMP Steelhead	MIIH
Pacific Lamprey	MIIH
Jenny Creek Sucker	NI
Umpqua Chub	NI
Mollusk	
California floater	NI
Western ridged mussel	NI
Highcap lanx	NI
Scale lanx	NI
Rotund lanx	NI
Robust walker	NI
Pacific walker	NI
Montane peaclam	NI
Insect	
Haddock's Rhyacophilan caddisfly	NI
Rhyacophila leechi, A caddisfly	NI

Species/Habitat Common Name	Proposed Action
T& E Species and Habitat: LAA = Not Likely to Adversely Affect, NE = No Effect, B-NLAA = Beneficial, Not Likely to Adversely Affect **Sensitive Species**: NI = No Impact, MIIH = May Impact Individuals or Habitat, But Will Not Likely Contribute to a Trend towards Federal Listing or Cause a Loss of Viability to the Population or Species, BI = Beneficial Impact	

O. RIPARIAN RESERVES

Activities associated with restoration treatments and new trail development, along with other connected actions associated with riparian treatments may result in non-compliance with Forest Service Riparian Reserve NWFP Standards and Guidelines or BLM 2016 RMP

Land management direction for the Upper Applegate watershed is contained in two separate documents: one for lands administered by the Rogue River-Siskiyou National Forest; and one for the lands administered by the Medford District Bureau of Land management. Although both land management plans contain and allocation for Riparian Reserves, each plan is unique.

Riparian Reserves include lands along all streams, lakes, ponds, wetlands, unstable areas, and potentially unstable areas that are subject to special Standards and Guidelines designed to conserve aquatic and riparian-dependent species.

Treatments on Lands Administered by the Forest Service

On National Forest administered lands, Standards and Guidelines apply to activities in Riparian Reserves that may otherwise retard or prevent attainment of Aquatic Conservation Strategy (ACS) objectives, as defined in the 1994 ROD for the NWFP.

The analysis of the Proposed Action is discussed in context of the affected sub-watersheds relative to Riparian Reserve Standards and Guidelines (1994 NWFP ROD, pages C-31 through C-39). These Standards and Guidelines were reviewed for applicability relative to the types of actions being proposed under the Proposed Action.

Table 35. Evaluation of Applicable NWFP Riparian Reserve Standards and Guidelines

	Standard and Guideline	Proposed Action
Timber Management	TM-1	For treatments in Riparian Reserves, the Proposed Action is designed to control stocking and create desired vegetation characteristics to meet ACS objectives.
Roads Management	RF-2	The Proposed Action proposes no new roads or landings within Riparian Reserves.
	RF-4	The Proposed Action proposes no new stream crossings.
	RF-6	The Proposed Action proposes no new stream crossings.
	RF-7	The Proposed Action related Road Management Objectives would continue to be in place and inspection and maintenance during and after storm events would be a reoccurring practice in this area.
Recreation Management	RM-1	No new trails or recreational facilities are proposed within Riparian Reserves under the Proposed Action.
	RM-2	The Proposed Action would improve the dispersed recreation site at the Placer area by restricted motorized access with the Riparian Reserve.

	Standard and Guideline	Proposed Action
Fire/Fuels Management	FM-1 and FM-4	The Proposed Action includes fuel treatment and fire suppression strategies, practices, and activities to allow attainment of ACS objectives and to minimize disturbance of riparian ground cover and vegetation. The Proposed Action recognizes the role of fire in ecosystem function (refer to Riparian Reserve project design criteria, Chapter 2 of the EA) and has identified instances where fire suppression or fuels management activities could affect long-term ecosystem function.
	FM-2	Incident bases, camps, helibases, staging areas, helispots and other centers for incident activities would continue to be located outside Riparian Reserves. All design specifications for existing and proposed roads and landings would minimize delivery of sediment to streams.
	FM-3 and FM-5	Under the Proposed Action, delivery of chemical retardant, foam, or additives to surface waters would continue to be minimized in accordance with the RR-SNF Fire Management Plan. The Proposed Action would enact treatments to make the landscape more fire resilient, which would have the indirect effect of requiring less fire suppression (i.e., retardant) needing to be used. Emergency and rehabilitation teams would evaluate fire damaged Riparian Reserves, per the RR-SNF Fire Management Plan.
Fire/Fuels and General Riparian Area Management	**Other And RA-4**	Under the Proposed Action, the goal of wildfire suppression in Riparian Reserves is to limit the size of all fires. As fuel reduction treatments are enacted and as monitoring is accomplished with additional information gathered, prescribed fire could become one of the tools used by land managers in the future in riparian areas. Rapidly extinguishing smoldering coarse woody material and duff is considered to preserve ecosystem elements. In Riparian Reserves, water drafting sites are located and managed to minimize adverse effects on riparian habitat and water quality, consistent with ACS objectives.
General Riparian Area Management	**RA-1**	Under the Proposed Action, there would be no measurable change to the timing, duration, or magnitude of low flow and peak flow conditions due to project design and employment of Mitigation Measures.
	RA-2	As part of project design and in accordance with Mitigation Measures for the Proposed Action, some trees may be felled in Riparian Reserves. These trees would be left on-site unless they adversely contribute to fuel loading.
	RA-3	The Proposed Action does not plan the use of herbicides, insecticides, toxicants, or other chemicals within or in proximity to Riparian Reserves.
Watershed and Habitat Restoration	**WR-3**	Mitigation measures employed under the Proposed Action are not used to replace any habitat degradation. Project design criteria and mitigation measure are employed to prevent any habitat degredation.

Treatments on Lands Administered by the BLM

Management Objectives for Riparian Reserves on lands administered by the BLM include:

- Contribute to the conservation and recovery of ESA-listed fish species and their habitats and provide for conservation of Bureau Special Status fish and other Bureau Special Status riparian-associated species.
- Maintain and restore natural channel dynamics, processes, and the proper functioning condition of riparian areas, stream channels, and wetlands by providing forest shade, sediment filtering, wood recruitment, stream bank and channel stability, water storage and release, vegetation diversity, nutrient cycling, and cool and moist microclimates.
- Maintain water quality and streamflows within the range of natural variability, to protect aquatic biodiversity, provide quality water for contact recreation and drinking water sources.
- Meet Oregon Department of Environmental Quality (ODEQ) water quality criteria.

- Maintain high quality water and contribute to the restoration of degraded water quality for 303(d)-listed streams.
- Maintain high quality waters within ODEQ-designated Source Water Protection watersheds.

No treatments are planned within Riparian Reserves with the exception of prescribed burning. All planned burning would be designed to meet these objectives.

P. AQUATIC CONSERVATION STRATEGY

Activities associated with restoration treatments and new trail development, along with other connected actions on Forest Service lands may affect attainment of the NWFP Aquatic Conservation Strategy (ACS).

On the Rogue River-Siskiyou National Forest portion of the project, the Northwest Forest Plan requires project consistency with ACS with specific reference to nine ACS Objectives. Below, is a summation of the environmental analysis regarding consistency with the elements and components of the ACS Objectives. Additional discussion and rationale may be found in analysis documented under other Relevant Issues including soils, hydrology, water quality, fisheries, and terrestrial wildlife.

ACS Objective 1. *Maintain and restore the distribution, diversity, and complexity of watershed and landscape scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.*

The Proposed Action is expected to have no effect on watershed and landscape-scale features because they are largely avoided. Density management (thinning) could occur within portions of intermittent, non-fish bearing stream Riparian Reserves, however canopy closure would not be reduced below 40% overall. Treatments would improve stand structure and composition.

Connected actions such as temporary roads would be developed outside of Riparian Reserves, utilized and decommissioned after use. Logging systems and use of temporary and existing roads for haul would employ extensive Project Design Criteria and Mitigation Measures. The Proposed Action would have an immeasurable and undetectable effect with a long-term beneficial effect on watershed and landscape-scale features.

ACS Objective 2. *Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian dependent species.*

The Proposed Action is expected to maintain spatial and temporal connectivity within and between watersheds. Density management (thinning) could occur within portions of intermittent, non-fish bearing stream Riparian Reserves, however canopy closure would not be reduced below 40% overall. Treatments would improve stand structure and composition. Connected actions such as temporary roads would be developed outside of Riparian Reserves, utilized and decommissioned after use. Logging systems and use of temporary and existing roads for haul would employ extensive Project Design Criteria and Mitigation Measures. The Proposed Action would have no effect on network connections and would not create any physical obstructions. There would be no measurable effect on aquatic and riparian dependent species, with a long term beneficial effect.

ACS Objective 3*. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.*

The Proposed Action is expected to maintain physical integrity of the aquatic system. Density management (thinning) could occur within portions of intermittent, non-fish bearing Riparian Reserves, however no activity would occur within 25 feet of the streamcourse. Treatments would improve stand structure, composition and the integrity of the aquatic system. Connected actions such as temporary roads would be developed outside of Riparian Reserves, utilized and decommissioned after use. Logging systems and use of temporary and existing roads for haul would employ extensive Project Design Criteria and Mitigation Measures.

ACS Objective 4*. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.*

The Proposed Action is expected to maintain water quality. Density management (thinning) could occur within portions of intermittent, non-fish bearing Riparian Reserves, however no activity would occur within 25 feet of the streamcourse. Treatments would improve the biological, physical and chemical integrity of the aquatic system. Connected actions such as temporary roads would be developed outside of Riparian Reserves, utilized and decommissioned after use. Logging systems and use of temporary and existing roads for haul would employ extensive Project Design Criteria and Mitigation Measures. There would be no measurable effect on water quality.

ACS Objective 5. *Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.*

The Proposed Action is expected to maintain the sediment regime under which aquatic ecosystems evolved, with an immeasurable and undetectable effect on sediment regime.

Density management (thinning) could occur within portions of intermittent, non-fish bearing Riparian Reserves, however no activity would occur within 25 feet of the streamcourse. Connected actions such as temporary roads would be developed outside of Riparian Reserves, utilized and decommissioned after use. Logging systems and use of temporary and existing roads for haul would employ extensive Project Design Criteria and Mitigation Measures. There would be no measurable effect on the sediment regime.

ACS Objective 6*. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.*

The Proposed Action is expected to maintain stream flow. Density management (thinning) could occur within portions of intermittent, non-fish bearing Riparian Reserves, however no activity would occur within 25 feet of the streamcourse. Connected actions such as temporary roads would be developed outside of Riparian Reserves, utilized and decommissioned after use. Logging systems and use of temporary and existing roads for haul would employ extensive Project Design Criteria and Mitigation Measures. There would be no measurable effect on stream flow.

***ACS Objective 7**. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.*

The Proposed Action is expected to maintain the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands. There would be no effects to these features. Indirect effects to floodplain inundation and water table elevation in meadows and wetlands are not anticipated.

***ACS Objective 8.** Maintain and restore the species composition and structural diversity of plant communities in Riparian Reserves and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.*

The Proposed Action is expected to maintain the species composition and structural diversity of plant communities in Riparian Reserves and wetlands. Manipulation of vegetation within Riparian Reserves would be generally avoided. No effects are anticipated that would affect species composition and structural diversity of plant communities within Riparian Reserves and wetlands.

***ACS Objective 9**. Maintain and restore habitat to support well distributed populations of native plant, invertebrate, and vertebrate riparian dependent species.*

The Proposed Action is expected to maintain habitat to support well distributed populations of native plant, invertebrate, and vertebrate riparian dependent species. There would be no measurable adverse effects, with a long term beneficial effect.

Therefore, as an overall determination, the impacts associated with the Proposed Action, either directly, indirectly, individually or cumulatively, would not prevent attainment of Aquatic Conservation Strategy, nor the nine ACS Objectives, at the site (Upper Applegate watershed), watershed (Analysis Area) or landscape (Upper Applegate River fifth-field) scales.

Q. NON-NATIVE PLANT SPECIES

Activities associated with restoration treatments and new trail development, along with other connected actions, may introduce or encourage exotic (non-native) and undesirable (noxious) plant species, or affect existing populations.

Under the current condition, there would be only vegetation or ground-disturbing activities that have current NEPA decisions. Therefore, there would be no new mechanisms to affect non-native species and current conditions would continue. Many species could potentially be introduced or spread under a high-severity wildfire situation due to suppression activities. The following table shows noxious weeds officially designated by the Oregon Department of Agriculture that may be found in the Upper Applegate watershed.

Table 36. Noxious weeds designated by the Oregon Department of Agriculture

Noxious Weed	Comments
Armenian (Himalayan) blackberry	Found in many parts of the watershed where riparian conditions exist, especially areas clos to roads or disturbed sites.
Bull thistle	Common in the Upper Applegate watershed. It is highly mobile from wind-born seeds and the soil holds bull thistle seeds that will germinate and grow when areas are disturbed. Most areas where this species is found in the watershed are not considered for treatment due to the transitory nature of the species and its response of decreasing in density with increasing shade.

Noxious Weed	Comments
Cut-leaf teasel	Found along Charlie Buck Gulch and along the Gin Lin Trail. These are the only known sites of this species on the Siskiyou Mountains Ranger District.
Dalmation toadflax	Known to occur on private land that borders the BLM and Forest Service near Star Ranger Station.
Diffuse knapweed	Known to occur in one area on Kanaka Road, near Applegate Dam, and another area adjacent to FS Road 1090.
English ivy	Occurs at one site near Gin Lin, and another on Beaver Creek. Like bigleaf periwinkle, this species is associated with historic occupancy, and is probably more widespread than documented.
Klamath weed (St. John's wort)	Generally found in low densities along roads or open areas within the watershed.
Medusahead rye	Found in many disturbed sites, roadsides, and dry slopes. It is often found in areas where yellow starthistle occurs.
Perennial peavine	Primarily known to occur along Upper Applegate Road and FS Road 1090. This species, like bigleaf periwinkle, is often associated with historic occupancy or homesteading, Unlike bigleaf periwinkle and English ivy, it is more likely to spread on its own and pioneer new populations.
Poison hemlock	Only known to occur at one location, on private land, near Star Ranger Station.
Scotch broom	Occupies 9 sites within the watershed. The largest concentration is found in T. 40S., R.3W., section 30, NW1/4 on both sides of the Applegate River. This site is adjacent to a large concentration on private lands. Several smaller sites are found: along the Applegate River at an old home site in T. 40S., R.3W., section 19 NW1/4; at Jackson Campground T. 40S., R.3W., sections 5 and 8; at four scattered sites across Upper Applegate Road from Jackson Campground in T. 40S., R.3W., section 5; and at an isolated site in T. 40S., R. 4W., section 24 NW ¼ of the NW ¼ section, south of unit 84.
Sulphur cinquefoil	Occurs on 16 populations across the Upper Applegate watershed. Most populations are small with isolated individuals.
Tree of Heaven	This species occurs on one location near Gin Lin Trail.
Yellow flag iris	One population occurs along the Applegate River mostly on private and BLM land near Star Ranger Station, and the other population occurs along Beaver Creek.
Yellow and Maltese starthistle	Found in at least 13 different locations in the watershed. Many of these sites are quite large and are located along roads (FS Roads 1090 and 1095) and around the Star Ranger Station compound. One large site of approximately 10 acres is located on an isolated parcel in T. 39S., R.3W., section 22 W1/2. The southern side of this parcel is adjacent to a private starthistle infested field and was used informally in the past by the previous adjacent landowner. In addition, many sites are found in adjacent locations on private land and Army Corps of Engineers managed land. Some sites are found ¼ mile or more away from any roads, the most notable being a recently discovered large population in T. 40s., R. 4W., section 24 NW ¼ of the NW ¼, south of unit 84.
Ventenata	Known from four sites in the Project Area, all of which occur along Kanaka Road, its spurs, or near Army Corps Land at the north end of the reservoir

Despite the use of project design criteria and mitigation measures, it is expected that there is a high potential for the Proposed Action to spread current infestations, introduce noxious weeds to other parts of the watershed, or facilitate the nearby infestations to spread into the treated areas. In particular, ground disturbing activities including tree-yarding or skidding, road decommissioning, trail creation, and/or temporary road creation and obliteration all have the potential to create areas suitable for invasion by invasive plant species. Manual and herbicide treatments of invasive plant populations are on-going and have shown great progress in curtailing or even exterminating invasive plant populations; nevertheless, there are still many extant populations near or within the areas proposed for ground-disturbing activities.

The Proposed Action carries a risk of introducing or spreading non-native species by opening up and disturbing habitat that may allow seeds to become established from current on-going activities in the watershed, and other neighboring private-land associated vectors. Humans, animals and machinery are vectors and any disturbance is an opportunity for establishment of these species. Furthermore, pre-existing seed-beds may be released by thinning and burning activities, stimulating new populations of invasive plants. Current levels of indirect risk of introduction or spread of non-native species would remain moderate. Mitigation measures to prevent and control the spread of invasive non-native plants would aid but not completely eliminate this risk.

On National Forest lands, mitigation measures were employed on the previously completed projects and no known spread or introduction of invasive species has occurred. It is unknown if any of the projects on private lands led to increased spread or introduction of invasive species but it is likely that this has occurred without mitigation measures in place.

R. HERITAGE (CULTURAL) RESOURCES

Activities associated with restoration treatments and new trail development, along with other connected actions, may affect archaeological or historical sites and/or current Native American values.

As a result of Section 106 consultation (pending), project design and the effective application of standard protection measures, the Upper Applegate Watershed Restoration Project would not result in any direct, indirect or cumulative adverse effects to districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places, or may cause loss or destruction of important scientific values, cultural resources, or historic properties.

The agencies are consulting with and would continue to consult with the Oregon State Historic Preservation Office, and federally recognized tribes regarding project effects, until the decision is reached. At the time of this document, one hundred and seventy-six cultural resources have been recorded within the area of potential effects for the UAWRP. Field surveys within the area of potential effects for the project area have not been completed. Formal consultation will occur with the Oregon State Historic Preservation Office to develop an agreement that would allow for phased surveys as described in Subpart B of the Section 106 process (36 CFR 800.4(b)(2)), and to resolve an potential adverse effects to historic properties (36 CFR 800.6(c)).

S. AIR QUALITY

Activities associated with restoration treatments and new trail development, along with other connected actions, may pose threats to public health and safety by temporarily reducing air quality from drifting smoke in residential areas and travelways.

The potential exists for changes in atmospheric conditions that would allow smoke and particulate matter to drift down slope into residential areas. Increase particle matter may cause minor short-term impacts on air quality, possibly aggravating symptoms for those sensitive to smoke.

The Upper Applegate watershed is located southwest of the non-attainment area of the Rogue River Valley. Non-attainment areas are identified through ambient air monitoring conducted by an air quality regulatory agency, and the Department of Environmental Quality (ODEQ), that presently exceed national ambient air quality standards.

The Medford area was designated a non-attainment area because air quality exceeded PM_{10} National Ambient Air Quality Standards. As a result, the Medford area became designated as the "Medford-Ashland Air Quality Management Area" (AQMA). The non-attainment status of this AQMA is not attributable to prescribed burning. Major sources of particulate matter within the Medford/Ashland area are smoke from woodstoves (63%), dust and industrial sources (18%). Prescribed burning contributes less than 4% of the annual total.

The Oregon State Smoke Management Plan (OAR 629 43 043) provides a specific framework for the administration of the smoke management program as administered by the State Forester. The Smoke Management Plan instructs the State Forester and each field administrator to maintain a satisfactory atmospheric environment in designated areas and other areas sensitive to smoke consistent with the plan objectives and smoke drift restrictions.

Particulate matter (PM) may cause a toxic effect on humans in the following ways: 1) the particulate may be intrinsically toxic because of its chemical and/or physical characteristics, 2) the particle may interfere with one or more of the mechanisms which normally clear the respiratory tract, and 3) the particle may act as a carrier for an absorbed toxic substance. Medical studies have shown a relationship between increases in particulate concentrations and rises in the number of clinic and hospital visits for upper respiratory infections, cardiac diseases, bronchitis, asthma, pneumonia, and emphysema.

Particulate matter standards were originally promulgated in 1971 and measured total suspended particulate matter (TSP). Later studies indicated that most of the adverse health effects caused by particulate matter were caused by the fine, inhalable particles, smaller than 10 microns in aerodynamic diameter, referred to as PM_{10}. In September 2006, standards were developed for particulate matter 2.5 microns and less in diameter, or $PM_{2.5}$.

Wildland fires are naturally occurring events, and can be responsible for emissions of substantial amounts of pollutants, particularly CO and particulates. Management activities such as proposed under Upper Applegate Watershed Restoration Project are attempting to minimize the risk of unmanaged large-scale fires. Minimizing this risk subsequently reduces the risk of large, uncontrolled air emissions, expected under the current condition.

Multiple summers with unprecedented levels of smoke are elevating the concern about how wildland fires are impacting air quality. Careful mechanical thinning in concert with prescribed burning can reduce wildfire emissions when they burn through a treated stand, and also dramatically increase fire suppression options. Prescribed burning releases much less smoke than wildfires, and they are conducted under conditions where smoke will be dispersed away from homes. The management activities proposed under Upper Applegate Watershed Restoration Project are expected to minimize overall smoke impacts to communities.

Under the Proposed Action, all prescribed burning operations would be conducted in compliance of Oregon Smoke Management Guidelines administered by Oregon Department of Environmental Quality (ODEQ). Monitoring indicates the amount of particulate matter $(PM)_{10}$ particulates from wildfires typically exceeds that which is produced from springtime prescribed burning.

During prescribed burning operations, smoke may drift across Upper Applegate Road reducing driver visibility. If smoke drift during operations becomes dense enough to create unsafe driving conditions, flag persons may be present to direct or delay traffic. Warning signs would be posted. Burn plans would call for halting operations until favorable smoke dispersal conditions exist.

Particulate Conformity Calculations

Analysis required under 40 CFR (51.853) for annual rates of PM10 and PM2.5 particulates were completed for the Proposed Action and is summarized in Table 37. This table displays a range of estimated tons produced due to the variability of existing and created fuels throughout the areas to be treated. Timeframes are also estimates; if implementation were to take longer than 7-8 years, the amount of particulates would be dispersed even finer.

Table 37. Estimated Tons of PM_{10} and $PM_{2.5}$ Produced by Proposed Action

	Years 1-2	Years 3-4	Years 5-6	Years 7-8	Total	Annual Average
PM_{10}	240-871	574-1593	642-1972	620-1750	2077-6132	260-767
$PM_{2.5}$	227-822	542-1453	690-1861	585-1651	2043-5787	255-723

Practices that would be employed to reduce emissions include burning concentrations of fuel (jackpot-burning) rather that the entire areas, burning when the fuel moistures are high (particularly in large fuels such as down logs), burning within four drying months of treatment when live fuel moisture is present in large fuels, burning when the duff is wet (during spring or within 5 days of measurable rain), using rapid ignition to achieve a high intensity fire, and further utilization of material prior to burning, i.e., firewood opportunities.

The burning of piled fuels can further optimize combustion, particularly when the amount of dirt in piles is minimized. The prompt "mopping up" of fires after the flames have diminished further reduces the amount of particulate matter produced.

Project design and mitigation measures are expected to reduce the potential for air quality degradation. Prescribed burn plan specifications consider localized air currents as well as local weather conditions to minimize the potential for aerial transport and production of partially-consumed fuels. Prescribed fire is typically ignited shortly after daybreak to take advantage of favorable wind conditions to disperse smoke.

As residences are located down-slope of proposed prescribed burning activities, it is predicted that smoke would not be visually evident until possibly evening hours when air currents travel down-slope after sunset. Smoke density is predicted to be minor with levels below ODEQ standards. Smoke may act to aggravate chronic breathing health symptoms in individuals residing nearby prescribed burning operations.

Since all burning would be prescribed and controlled, there would be ample opportunity to schedule burning when the atmospheric conditions are optimal for smoke dispersal. Likewise, there would be an opportunity to limit the size of burning events to control emissions. It is expected that the Proposed Action would not result in a violation of National Ambient Air Quality Standards, or an appreciable reduction in air quality related values.

Activities designed to minimize the risk of conflagrations through prescribed burning and surface fuel/ladder fuel reduction may lead to temporary increases in air emissions. However, these emissions are smaller in volume than natural fires, and can be scheduled to take advantage of favorable meteorological conditions.

T. SCENIC QUALITY

Activities associated with restoration treatments and new trail development, along with other connected actions, may affect the resulting visual character (evidence of management) and/or attainment of visual quality objectives for scenic quality.

Under the Rogue River National Forest LRMP each Management Strategy has an assigned Visual Quality Objectives (VQOs) in order to maintain a sense of a natural system and meet the public's scenic expectations in the National Forest.

In the Upper Applegate watershed, visual quality objectives and guidelines associated with Modification and Maximum Modification VQOs would be met with the Proposed Action. Mechanical thinning and prescribed fire are expected to create openings in the forest less than ¾ acre. These openings would create a more park like appearance that is characteristic of old growth forests and the naturally established form of the landscape would be maintained.

A short- term impact to scenic quality in the immediate foreground (< 300 ft.) in the Retention and Partial Retention VQO areas would occur with ground and vegetation disturbance, slash piles, and prescribed fire. Immediate foreground views from portions of some trails, roads, campgrounds and distant views from certain viewpoints on trails would change following treatments. These activities would create some ground and vegetation disturbance and slash that visitors would be able to see along road and trails and from the campgrounds.

The resulting change in forest appearance or views along trails, with nearby treatment units, would not be dramatically different than current conditions. Several previous treatments (prescribed fire, thinning, and commercial timber sales) have occurred in this area in the past, and the current forest landscape is varied, including evidence of even and uneven aged vegetation management. Views currently include a mix of vegetation textures and color, tree sizes, and natural openings.

The visual impacts from treatments in both the short-term and long-term would be minimal to undetectable depending on the user. In the long-term removing the thick vegetation by thinning would produce a more open, park like appearance with large trees characteristic of old growth stands and immediate foreground views from trails, roads and campgrounds would blend into the landscape within a few years as vegetation returns. The clearings and thinning work would repeat the form, line and texture from the surrounding vegetative pattern to achieve the partial retention objective.

Past actions in the project area include the construction of existing roads and trails, which are used as viewing platforms and, therefore, are generally not considered negative visual elements. Recreation sites (such as campgrounds and picnic areas) have not resulted in substantial impacts to visual resources. Most visitors to the area travel on Upper Applegate Road, Forest Road 20 and County Road 788 and some past vegetation management activities can be observed from these roads. Past wildfires and insect infestations have affected visual quality in some areas in the Upper Applegate Valley, however, these are natural disturbances in the landscape and, therefore, generally not considered in effects analyses.

Since the actions described above do not contribute substantial effects to visual quality, the proposed project, when added to past, present, and reasonably foreseeable future actions, is not expected to cause cumulative effects beyond those described in the analysis.

U. OPERATIONAL AND ECONOMIC FEASIBILITY

The design of restoration treatments may or may not be operationally feasible (are they possible?), and/or are they economically feasible (is there a way to fund treatments?).

This issue focuses on the operational feasibility and the mechanisms to fund restoration treatments. Because there would be no activities associated with the current condition, the discussion of operational feasibility for this alternative is not applicable.

Operational feasibility has been addressed during the design phase of the Proposed Action. It is assumed that all of the proposed treatments can be physically accomplished (humanly possible). All of the restoration activities proposed have been successfully accomplished either on other locations on the Rogue River-Siskiyou National Forest and the Medford District, BLM or on other areas with similar attributes. Therefore, all activities under the Proposed Action are operationally feasible.

Under the current condition, there would be no costs associated with restoration and no funding needs nor would there be any potential revenues generated to fund future restoration treatments.

A review of past contracts for performing restoration projects (similar to non-commercial thinning costs) provides a general per unit cost for completing this type of work. An approximate average ranges from slightly below $1,000 to over $1,200 per acre to complete understory thinning and activity fuel treatments such as hand piling and burning. The cost for prescribed fire (underburning) ranges from $300 to $600 per acre, depending on the complexity of the activity (amount of fuels, topography, etc.).

If these average costs per acre are assumed, then it is estimated that the restoration treatments within the Upper Applegate watershed could be completed for approximately ten to fourteen million dollars (this assumes approximately $1,000 per acre for mechanical treatments and $500 per acre for maintenance treatments, times the number of treated acres). If the total cost were spread over a fifteen year period, it would work out to a cost of just under one million dollars per year to accomplish the restoration objectives.

With stewardship authority, the potential for economic return from the sale of products would help pay for some of the cost of implementing treatments. Under the Proposed Action biomass could be made available to the woods product industry. It is estimated that the Proposed Action would remove approximately 5-7 MMBF (million board feet) of biomass from trees greater than nine inches in diameter. This could generate approximately from 2-4 million dollars for the Proposed Action depending on current market conditions which would determine the actual value of the biomass available for commercial removal.

Funding is a variable that is difficult to predict. Stewardship contracting or agreements are only one of the options being considered for implementation of the UAWRP. There are also standard timber sale contracts, service contracts, partnerships, and other methods that may be employed. No specific method is favored or has been selected. An evaluation of all the options would be employed to determine the most effective method for implementing the restoration treatments.

The UAWRP would also support local economies through recreation use. The Forest Service invests in such things as the construction and maintenance of infrastructure, environmental restoration, and forest health.

In 2016, the sum of these activities on the entire Rogue River-Siskiyou National Forest supported approximately 2,330 local jobs and $111,336,000 in local labor income[3].

V. GRAZING ALLOTMENTS

Activities associated with restoration treatments and new trail development, along with other connected actions, may affect allotment management practices and timing of use.

There are portions of two grazing allotments that are present in the Upper Applegate watershed: Beaver-Silver and Upper Big Applegate.

Beaver-Silver Allotment

This allotment totals approximately 31,038 acres. The Beaver-Silver Allotment has two grazing permittees. One permittee uses lower Beaver Creek and Yale Creek up to Silver Fork Basin. The other permittee uses Beaver Creek, shared pasture with BLM and Forest Service, a portion of Mule Creek, along Forest Service Road 20 to Silver Fork and then to the Donomore Meadows area. This allotment has range improvements including fences, spring developments, and a cabin.

The allotment does have ample water and springs. The lower part is mixed with BLM and Forest Service managed lands. Like all allotments on the Siskiyou Mountains Ranger District, conifers are encroaching on meadows. Any thinning activities and introduction of fire to remove the fuels would improve the allotment.

Upper Big Applegate Allotment

This allotment totals approximately 89,515 acres. The Upper Big Applegate Allotment currently has one grazing permit and two permittees that use the allotment. The allotment has extensive range improvements which include allotment and pasture fences, spring developments with spring boxes, pipelines, troughs; and corrals.

Meadows are becoming over-grown with conifer trees. Thinning, tree and brush removal, and prescribed fire would improve these areas.

Within the Upper Big Applegate allotment, the Proposed Action including thinning and prescribed fire would improve the understory diversity and forage for livestock and wildlife. Broadcast burning would be preferable to pile burning to increase the understory forage base and botanical resources. A focus on trees encroaching meadows should be addressed to reduce losses of meadows for livestock and wildlife populations.

Roads are important to administration and success of the permits. There is a concern that thinning could remove natural boundaries between allotments and housing developments that may require fences to be built to keep cattle away. An option to fencing could be leaving large down trees in strategic areas to prevent cattle from moving outside the allotment and thus maintaining natural allotment boundaries.

In summary, the UAWRP would enhance understory vegetation within the allotments for livestock and wildlife, however the project needs to cautious not to open areas along allotment boundaries or housing developments. Opening up the trees along housing developments could entice livestock and wildlife near them and potentially create conflicts.

3 http://fsweb.wo.fs.fed.us/economic_contribution/documents/EconomicContributionWebsiteUserGuideApr2016.pdf.

4. OTHER EFFECTS

The following is a summary of effects that were considered during the analysis process, not necessarily as issues, and not always totally quantifiable. All effects were determined to be consistent within the standards and guidelines identified in the Rogue River National Forest LRMP and the Southwestern Oregon Record of Decision and Resource Management Plan (2016 ROD/RMP). Analysis of these issues contributes to informing the decision makers.

A. RELATIONSHIPS BETWEEN LOCAL, SHORT-TERM, USES OF THE HUMAN ENVIRONMENT AND MAINTENANCE OR ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The Proposed Action would help to protect long-term productivity by improving stand resilience to natural disturbances. With full implementation of the mitigation measures and management requirements and constraints developed for the Proposed Action, soil productivity would be maintained over the long-term.

Short-term uses are expected to change the human environment during prescribed burning and logging/hauling operations. Long-term effects should not appreciably change the human environment after restoration-related operations have concluded.

B. IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irreversible commitment of resources refers to a loss of non-renewable resources, such as mineral extraction, heritage (cultural) resources, or to those factors, which are renewable only over long time spans, such as soil productivity. Under the current condition, there would be no irreversible or irretrievable commitment of resources.

Irretrievable commitment applies to losses that are temporary, such as use of renewable natural resources. The production lost would be irretrievable, but the action would not be irreversible. Vegetation removed as commodity byproducts under the Proposed Action, is considered an irretrievable impact. Forest conditions would return, but it would take one or more decades for them to obtain the current conditions.

The vegetation that would be removed under the Proposed Action also has value as wildlife habitat, and/or human value for recreation or aesthetics, and would be irretrievably lost. However, this impact is in accordance with the management goals and objectives of restoration treatments.

C. EFFECTS ON PRIME FARMLAND, RANGELAND AND FORESTLAND

Prime forest land is not applicable to lands within the National Forest System. Under the Proposed Action, Forest system lands would be managed with coordination and sensitivity to the effects on adjacent lands. The UAWRP would enhance understory vegetation within range allotments for livestock and wildlife.

D. EFFECTS UPON WETLANDS AND FLOODPLAINS

No floodplains, associated with Executive Order 11988, exist within the Upper Applegate watershed. The Proposed Action would constitute a "no effect" undertaking in relation to the Wetlands Executive Order 11990 because no wetlands are involved. There would be no effects on floodplains associated with Executive Order 11988 as a result of implementing this fire hazard reduction proposal, as none exist or would be affected.

The portion of the Proposed Action on lands administered by the Forest Service would be in compliance with Riparian Reserve standards and guidelines to allow attainment of the Northwest Forest Plan Aquatic Conservation Strategy. On lands administered by the BLM, treatments within Riparian Reserves would be consistent with the Southwestern Oregon Record of Decision and Resource Management Plan.

E. ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

Implementation of the Proposed Action would cause no known unavoidable or other indirect adverse effects, other than the effects already stated.

F. SOCIAL/ECONOMIC EFFECTS

The availability of natural resources contributes to the quality of life for many county residents. Many communities are closely tied to the forest in work and recreation. These communities are directly influenced by changes in the supply of resources produced from the forest, and by the forest production of firewood, game, scenic resources, and recreational opportunities. Implementation of the Proposed Action would cause no unavoidable or other indirect social/economic adverse effects, other than the effects already stated.

G. ENERGY REQUIREMENTS

Under the Proposed Action, various amounts of fossil fuels, and human labor would be expended. Fossil fuel energy would not be retrievable: Neither are not in short supply and their use would not have an adverse effect upon continued availability of these resources.

H. ENVIRONMENTAL JUSTICE

Environmental Justice means that, to the greatest extent practicable and permitted by law, all populations are provided the opportunity to comment before decisions are rendered on, are allowed to share in the benefits of, are not excluded from, and are not affected in a disproportionately high and adverse manner, by government programs and activities affecting human health or the environment.

One goal of Executive Order 12898 is to provide, to the greatest extent practicable, the opportunity for minority and low-income populations to participate in planning, analysis, and decision-making that affects their health or environment, including identification of program needs and designs. The Proposed Action, its Purpose and Need, and area of potential effect have been clearly defined. Scoping under the National Environmental Policy Act has utilized extensive and creative ways to communicate.

The Proposed Action does not have a disproportionately high and adverse human health effects, high or adverse environmental effects, substantial environmental hazard, or affects to differential patterns of consumption of natural resources. Extensive scoping did not reveal any issues or concerns associated with the principles of Environmental Justice. No mitigation measures to offset or ameliorate adverse affects to these populations have been identified. All interested and affected parties would continue to be informed throughout the decision making process.

There would be no discernable differences between the Proposed Action and the current condition regarding effects on Native Americans, women, other minorities, or the Civil Rights of any American Citizen.

I. PUBLIC AND WORKER SAFETY

There may be a concern for increased risk of accidental injury to members of the public who recreate in the Upper Applegate watershed during implementation activities. The application of mitigation measures designed for the protection of forest visitors would minimize this risk. Mitigation measures would include: restricted operations during specific industrial implementation actions; informing forest visitors of alternative use areas through signing; and partial or complete closure of some areas during implementation activities.

All project activities would comply with State and Federal Occupational Safety and Health (OSHA) codes.

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